THE

Practical Teacher

A MONTHLY EDUCATIONAL JOURNAL

Edited by JOSEPH HUGHES.

'*Knowledge is proud that he has learned so much,*
Wisdom is humble that he knows no more.'—COWPER.

VOL. II. No. 1. MARCH, 1882. PRICE 6D. POST FREE, 7½D.

School Surgery.

BY ALFRED CARPENTER, M.D. (LOND.), C.S.S. (CAMB.),
Vice-President of the British Medical Association.

I.

IT is proposed to consider this part of our subject under three heads, all of which are connected with a departure from a proper condition of health, and may be common to all schools, and which require immediate attention on the part of those in authority. These departures may be general or particular, may apply to considerable numbers of children at one and the same time, or be personal only to one or more as being caused by one's own or another person's act. The measures to be taken by the teachers have reference to the prevention of disease or accident, as well as to the removal of their incidence when they do arise. They separate themselves into *School Hygiene*, or measures connected with the subject of infectious disease; *School Surgery*; and a less important division, which includes simple instruction upon *Medicine*, and is connected more directly with disturbances of health, especially those which are trivial and do not require medical attendance.

School Hygiene includes a consideration of the measures requisite to prevent the admission of infectious diseases, to prevent their extension when they are unfortunately admitted, and to remove them from the precincts of the school as soon as possible after admission, so as to avoid the necessity for closing the establishment altogether.

Under the head of *School Surgery* we shall consider the accidents which more properly belong to school life; and also the emergencies which are of frequent occurrence, and which render a knowledge of the principles which ought to be followed absolutely necessary on the part of those in authority, so that no mischief may be done before the surgeon, who may have been summoned, can possibly appear upon the scene; and lastly, we have the simple principles of household medicine, which should be known to all men and women who are heads of establishments, and especially to those who have a number of young people under their care.

Nimia cura medici, which some people are supposed to require, and which uneducated people too often indulge in, does more harm than good. A knowledge without prudence, a zeal without discretion, and a theory without practice, are all bad; but they are especially so in the arena which belongs to the properly educated medical man. It follows, therefore, that nothing is put forward here which is intended to supersede the necessity for medical advice when it can be obtained, but only to provide for emergencies when no doctor is at hand, and when attention is wanted immediately, or in which it is important that the school authority should know how to act when such emergency does arise, and when action must be immediate.

These rules are based upon those which every properly educated medical practitioner will be sure to follow upon his arrival on the scene, and there will be so much time gained, either in preventing mischief from accident, in arresting the progress of infectious disorder by taking time by the forelock, and preventing altogether the necessity for further medical aid, "Prevention being better than cure" on all hands, and no body of men recognise this more fully than the honest-hearted medical practitioner.

School Hygiene.—The conduct of masters regarding infectious diseases requires more consideration than it gets at present. The difficulties which are daily arising in all parts of the country from a neglect of proper rule is such as justifies early attention to this part of our subject.

No child should be allowed to come to school who is personally suffering from any of the ordinary infectious diseases. They are Measles, Scarlet fever (or scarlatina, as it is often called), Diphtheria, Whooping-cough, Mumps, Small-pox, Chicken-pox (or glass-pox), Scald head (or ringworm), Purulent Ophthalmia, and Scabies (or itch).

If the school be a boarding-school, any child suffering from any of these diseases must be at once removed from the school, and all those who have been in contact with that particular child for the preceding twenty-four hours should be put in quarantine—that is, to be kept separated from the rest of the school. No person should be allowed to return to school after recovery from any of the above diseases until after they have been thoroughly disinfected, and after the lapse of a certain period, which should date from the termination of the fever stage. This disinfection must include a proper bathing of the whole body in some disinfecting fluid, such as a weak solution of Condy, or

water in which some chlorinated soda has been mingled. If the whole body is well sponged over with some water containing 1 per cent. of Condy or chlorinated soda, and then well scrubbed in a bath with some oatmeal, the whole of the infecting matter on the body may be rapidly removed. It is requisite to cut the hair, and then to wash the head first with the disinfecting solution, and then with some water, to which a little borax has been added; half an ounce of borax in a quart of water is a cleansing solution which will dissolve particles of epithelium, and prevent them from clinging to the hair to the danger of the child's fellows. The nails, both of fingers and toes, should be cut, and the ears washed out, and if the process of washing is repeated every day for a week there will be but little chance of danger to other children from that particular cause, provided there are no eruptions and no discharging abscesses or other sequences of the disease itself upon any part of the body; these are generally found at the alæ of the nose, behind the ears, or near to one of the orifices of the body. These should be all cured before the child is readmitted to the school.

Where possible, a medical certificate should be produced, which should state that the child is free from infective power: but if no certificate is forthcoming, a child should not be admitted into school until three weeks after recovery from measles, a month after scarlet fever, at least six weeks after diphtheria, three weeks after mumps, a month after small-pox, provided all scabs have disappeared in that time, and nearly as long for chicken-pox. No definite time can be fixed for whooping cough, and it is doubtful whether, if it be in a given neighbourhood, it can be excluded from a large school, but no child actually whooping should be allowed to stay in the school.

Ringworm or scald head arises in the majority of instances from want of washing. If such cases appear in any school, all the children should have their heads well washed with soap and water, and afterwards well sponged over with a solution of borax—an ounce to a gallon of warm water should be about the strength of the solution—whilst those children who have the disease manifestly present should be kept at a distance until the places are perfectly well. It is right, however, to state that a large number of cases which are called ringworm are not the true disease. The real ringworm is characterised by the presence of a vegetable growth in the epidermis. A microscopical fungus, styled the 'tricophyton,' produces one form of true ringworm. They are either isolated spores or jointed filaments, which attack the scalp and grow in the hairs and their sheaths, and also amongst the epidermis of the scalp and other parts of the body. There are several of these parasites which produce disease in the hairy structures. They can only be cured by plucking out the diseased hairs, cleansing the patches first with soft soap, then with solution of borax, and lastly applying equal parts of sulphurous acid and glycerine. The diseases are various forms of tinea, and are at first scarcely to be distinguished from harmless patches of tetter or simple lichen, except by the expert. The worst form of infectious ringworm is that which is styled 'tinea favosa.' It is produced by a fungus called 'achorion,' an dit is at once known by the presence of yellow, cup-shaped crusts on the scalp; it is highly infectious, very difficult to cure, and on no account should a subject of it be admitted into the society of other children. It is always a mark of badly-nourished, badly-fed constitutions, and associated with filthy habits.

Cleanliness of head is a necessary contingency in all schools, so that the chance of infection may be avoided. All large schools should have a place in which the hair should be combed and the head properly cleansed as frequently as may appear necessary. The operation should be superintended by a monitor or person appointed to see its due execution; a senior child in turn should take this duty under the control of the teacher. The brushes and combs in use must be kept clean, and each child restricted to his own articles. In elementary day schools it would be good practice to have occasional inspection drill as regards the children's heads. I am sure it is far more important to teach children the necessity for clean heads than for nine-tenths of the tasks which are done in the school hours, and yet I am not aware of a single day school in which such an inspection drill exists. It would assist the master or mistress very materially in their work by checking irritation, and will assist very much in diminishing the incidence of infection at any rate as regards diseases of the scalp.

Purulent or infectious Ophthalmia is a very troublesome disease, and when it has obtained hold in a school it is very difficult to eradicate; personal attention to each case and rigid isolation will alone effect its removal, whilst it often happens that much injury is done to eyesight in consequence. The disease which is called Scabies or Itch is not uncommon in some elementary schools; it is not usual to take much notice of it, but a child who is the subject of it ought not to be admitted into any school until he is cured. This is not a difficult matter; it can be effected in three days if the disease be vigorously attacked. It is due to a small insect somewhat like a cheese-mite, which burrows in the epidermis and lays its eggs, the hatching of which gives rise to the itching from which the disease is named. Sulphur is fatal to the insects themselves, and if used by inunction, so that the canals leading to the nests of the insect get filled with the sulphur itself, the young brood are destroyed as soon as they change their state from ova to developed acari, whilst all the insects which have been previously hatched, both male and female, are at once destroyed by contact with the sulphur.

The preceding observations apply to children who are suffering or have suffered from disease, but it may be that the child is not himself affected, but is living in a house in which some one else is suffering from infectious complaint, and that child may convey the disease to his school-fellows. No child should be allowed to attend school under these circumstances. The rule, however, may be somewhat relaxed in the case of children who have already had an attack of the same kind of disease at some anterior period, say in the preceding year, provided they are kept from all immediate contact with sick persons until the recovery and disinfection are complete. It may also be relaxed in the case of those children who, not having themselves had the disease, have not been in contact with the case and have been at once removed to an uninfected house; or if they have been in contact with the case, then a fortnight's quarantine should be established, which will clear them all from the possibility of becoming the subject of infectious complaints if they have escaped infection on that occasion. Children are frequently sent to school whilst suffering from an in-

fectious disease, which had not been recognised because it is extremely mild, or in its very early stage, or, as too often happens, because the parents are careless as to other people, and won't take the trouble either to verify their suspicions or even to prevent mischief when they know that it is likely to happen. The teacher or director of every school should, therefore, give immediate personal attention to any one who may appear ill or complains of feeling unwell. Feverishness should lead him to suspect the presence of infectious disease, and if the teacher could be provided with a thermometer, such as is now in common use among medical men, he need never be in doubt upon this head. If the feverishness is combined with any kind of rash upon the skin, or with any appearance or complaint of sore throat, or with both, he need be under no difficulty as to the advisability of that child leaving the school-house as soon as possible. The thermometers are provided by all the surgical instrument makers, and are of very simple construction; they have an index which registers the highest temperature. If this is placed in the axilla or armpit of the child, so that the mercury in the bulb is kept in contact with the skin at the deepest part of the axilla for five minutes, it will register the highest temperature. If this exceeds 100 (the normal being 98·5) it is evident that the child should not be at school at all, and should be sent home at once, or if it be a boarding-school, the child should be put in quarantine.

(To be continued.)

—o—

Eminent Practical Teachers.

PESTALOZZI.

BY THE REV. CANON WARBURTON, M.A.,
Her Majesty's Inspector of Training Colleges for Schoolmistresses.

JOHN HENRY PESTALOZZI* was born as long ago as 1746, but he lived to be past eighty years of age, and many of those who knew him, and some of those who were taught by him, are still alive.

Quite apart from his reputation as a teacher he was a remarkable man, and his history is well worth studying and laying to heart; there is much in it to be admired—admired perhaps, rather than imitated, much to be avoided, perhaps, rather than to be condemned. He was not a very wise, certainly not a very practical man, but he had in him something of the Divine gift of Genius,—a heaven-sent conviction that he had found a new truth, and a passionate yearning, which no difficulty could deter or failure dishearten, to turn it to account for the benefit of mankind.

His father, who had been a doctor, died when Pestalozzi was only six years old, and the boy was brought up in narrow circumstances, but still 'as a spoilt darling,' so he tells us, 'by one who was the best of mothers,' but too much absorbed in household cares to attend much to the development of her son's character. Many of the errors and weaknesses of his manhood are undoubtedly traceable to his want of masculine example and discipline as a boy; but, on the other hand, the tender affectionateness which he learned from his mother is the keynote of his life, and has coloured the whole system of education of which he was the originator.

His birth-place was Zurich, the capital of the Swiss Canton of that name,—and there he went to school. 'In all school games,' he says, 'I was the clumsiest and most helpless of all the boys, yet always trying to excel them. They used to call me "Wonderful Harry from Foolstown." They liked me for my good nature, though they were always laughing at my awkwardness and thoughtlessness about everything that did not particularly interest me. Though one of the best of the scholars, my flightiness led me to commit faults of which the worst of them were never guilty. Generally seizing with quickness and accuracy upon the essentials of the subjects taught me, I was indifferent and careless as to the form and method. At the same time that I was far behind my classmates in some parts of my work, in others I surpassed them in a remarkable degree. The wish to be acquainted with some branches of knowledge that took possession of my heart and imagination, even though I neglected the best means of acquiring them and of exercising myself in them, was strong in me to enthusiasm; and it unfortunately happened that the tone of public culture in my native town was at this time eminently calculated to foster the ambition of taking an active interest in affairs, long before one had had sufficient experience or training for such an attempt. Freedom, beneficence, self-sacrifice, and patriotism were the watchwords of our education; but the means of attaining to all this which was especially commended to us, namely, cultivation of the intellect, was left without that solid and efficient training of the practical ability which is the essential condition of its success. We imagined, whilst yet in the position of school-boys, that by a superficial school acquaintance with the great civil life of Greece and Rome, we should eminently prepare ourselves for the little civil life of a Swiss canton.'

In his holidays Pestalozzi frequently paid long visits to his uncle, the pastor of a rural village three miles from Zurich, where he became much attached to, and beloved by the country folk. A strong antagonism existed at this time in Switzerland between town and country, aristocracy and poor, and Pestalozzi took part, enthusiastically, as was his wont in everything, with the latter; and conceived a strong prejudice against the higher classes, by whom he believed his humbler neighbours to be oppressed—a prejudice which largely and, it must be added, injuriously affected both his character and his career.

He had no sooner emerged from boyhood than he fell under the influence of the famous Jean Jacques Rousseau, whose ideal scheme of liberty, with its visionary speculations on philosophic education and contempt for established scientific methods, had at this time taken hold of the imagination, and deeply tinged the ideas of the younger generation. Rousseau's educational treatise 'Emile' appeared when Pestalozzi was sixteen, and had before long run the round of all the European languages, and was regarded almost in the light of a new revelation. The young enthusiast found something which went straight to his own heart in Rousseau's fervid and tender love for humanity, in his sympathy with the sufferings of childhood, and his profound feeling of the political and social corruption of the times. No sooner had Pestalozzi read 'Emile' than the whole home and public education of the

* Pronounced Pest-a-lot-zy. He was, of course, a Swiss, but the name is of Italian origin, and in the Italian language the first of two 'z's' coming together is pronounced like a 't.'

world at all previous times and in all ranks of society appeared to him as one gigantic blunder, which could be rectified only by the realization of Rousseau's ideas.

As yet, however, he had not awakened to a consciousness of his vocation and destiny as a practical teacher of children. The first effect which the study of Rousseau produced upon his mind was to induce him to abandon the preparation which he had already begun for the clerical profession; in the hope that by devoting himself to jurisprudence he might find a career more adapted to procure for him a position in which he might exert an active influence on the social condition of his native land. One of his biographers, however, tells us that he abandoned theology, because he broke down twice in his first sermon, and found himself incapable of committing even the Lord's Prayer accurately to memory.

Among the friends of his youth who exercised an influence in the formation of his ideas and character were the celebrated Lavater, of whom we shall hear again, and a gifted youth named Bluntschli, who died of consumption at an early age. In his last moments Bluntschli sent for Pestalozzi, and said to him, 'I am dying, and when you are left to yourself you must not rush into any career which might be dangerous to you from your easy and confiding disposition. Try to find some quiet tranquil line of life, and unless you have by you a friend who will faithfully assist you, with a calm dispassionate knowledge of men and things, by no means embark in any undertaking whose failure would be disastrous for you.' Such was his friend's estimate of his character, but that no one knew its defects better than he did himself is sufficiently proved by the extract which follows from a love-letter to his betrothed, the beautiful and high-minded Anna Schulthess.

'Dearest Schulthess, those of my faults which appear to me the most important in relation to the situation which I may occupy in after-life are improvidence, flightiness, and want of presence of mind to meet unexpected emergencies. I cannot tell how far these faults may be diminished by my efforts to counteract them by calm judgment and experience. At present I have them still in such a degree that I dare not hide them from the maiden I love; they are defects, my dear one, which deserve your fullest consideration. I have other faults arising from my irritability and sensitiveness which often refuse to submit to my judgment. I very frequently let myself run into excesses in praising and blaming, in likings and dislikings. Whenever my country or my friend is unhappy, I am myself unhappy. Direct your whole attention to this weakness; there are times when the cheerfulness and tranquillity of my soul will give way under it . . . Of my great and even culpable negligence in all matters of etiquette, I need not speak; any one can see all that at the first sight of me. I also owe to you the candid confession, my dear one, that I shall always consider my duties towards my beloved partner subordinate to my duties towards my country, and that though I shall be the tenderest of husbands, nevertheless, I hold it to be my duty to be inexorable to the tears of my wife, if she shall ever attempt to restrain me by them from the performance of my duty as a citizen. My wife shall be the confidante of my heart, the sharer of all my most secret counsels; a great and honest simplicity shall reign in my house. And one thing more: My whole heart is my country's; I will risk all to alleviate the need and the misery of my countrymen. What consequences may the undertakings to which I feel myself impelled draw after them! How unequal to them am I! and how imperative is my duty to show you the possibility of the great dangers they may bring upon me!

'Decide now for yourself, whether you can join your heart to a man with these faults and these prospects in life—and be happy. I love you so dearly from my heart, that this step has cost me much. I fear to lose you, my darling, when you see me as I am. I had often thought, 'I will be silent'; but at last I have conquered myself, and I rejoice at what I have done.'

Bluntschli had scarcely been a month dead when Pestalozzi fell so dangerously ill that he was on the point of following his friend to the grave. His physician told him that he must give up all scientific study and rest his brain. His sympathy with Rousseau's anti-scientific ideas made this abandonment ot methodical study only too easy. He sold his books, burned his MSS., and betook himself to a farmer ot considerable reputation, named Tschiffeli, in the Canton of Bern, and sought his instruction and advice as to the best means of realising his dreams for the amelioration of the condition of the poor. It was an unfortunate selection of a counsellor. 'I came to him,' says Pestalozzi, 'a political visionary, and left him an agricultural visionary, full of enthusiasm for my gigantic schemes fresh awakened by his plans, which, though difficult of execution, and in the main impracticable, were bold and original in conception.'

Tschiffeli had become famous by his plantations of madder, and Pestalozzi's first practical essay was in the cultivation of this plant. He induced a wealthy firm, in Zurich, to become partners with him in the purchase of one hundred acres of chalky heathland for this purpose, on which he immediately proceeded to erect an Italian villa. To this house and estate he gave the name of *Neuhof, and there he settled at the age of twenty-four with his fair wife, Anna Schulthess, who had ventured, in spite of the warnings of the love-letter above quoted, to throw in her lot with his.

The madder plantation proved a failure. The Zurich firm which had advanced the money for the undertaking, withdrew it at a sacrifice rather than risk the whole in such incompetent hands. Pestalozzi now found himself thrown upon his own resources, but with extraordinary courage, or extraordinary imprudence, he determined not only to go on with his agricultural speculations, but to combine with them a school for the gratuitous education of poor children. He drew up and made public a scheme for the establishment of this institution, and his plans and principles commanded such general approbation that, in spite of a growing distrust in his practical ability, he received offers of assistance from several of the principal towns of Switzerland. The 'Neuhof Poor School' opened in 1775, with fifty scholars. It was what we should now call an industrial school, for the children were to help out their expenses by their earnings, working in summer on the farm, and in winter at weaving, spinning, and other indoor occupations. The plan was a good one, and such a school has since then many and many a time proved almost self-supporting in competent hands, but it failed in those of Pestalozzi. Discipline never existed; the children would not work while they stayed with him, and ran off when they got new clothes,

* Pronounced Noy-hofe.

the civil authorities declining to interfere. These, however, were difficulties which time and patience might have overcome. The real cause of failure lay in the fact that he tried to carry out his experiment on a scale quite disproportioned to his skill, capital, and experience. It was an undertaking which required and presupposed a thorough knowledge of manufactures, men, and business, in which, to use his own words, he 'was deficient in the same proportion as such knowledge was indispensable to him in the direction which he had given to his undertaking.' 'I who so entirely disapproved of hurrying on to the higher stages of instruction before a thorough foundation had been laid in the elementary stages, looking upon it as the fundamental error in the education of the day,—allowed myself to be carried away by illusions of the greater remunerativeness of the higher branches of industry, without knowing even remotely the means of teaching, or even of learning them,—and to commit the very faults in training up school children to spin and weave, which I so strongly reprobated and denounced, and which I considered dangerous to the domestic happiness of all classes.' There never was a more candid confession of incapacity, but still he struggled on, his noble wife assisting his endeavours,—determined to share his last crust with his children rather than turn them adrift. 'He lived like a beggar to teach beggars how men live.' He laboured night and day to raise others from the misery into which he had himself fallen. At last, however, all was spent, and, in addition to that, he became deeply involved in debt; his own small fortune and his wife's considerable one had melted away. In 1780 the Neuhof School was closed, and Pestalozzi found himself in 'his elegant country house' all but penniless, with a wife whom trouble had thrown into a lingering illness, and the wolf at the door. 'When my experiment went to wreck,' he writes, 'the blind confidence which people had reposed in me changed into just as inconsiderate a distrust. All belief in the qualifications which I really possessed was now lost, along with the belief in those which, in my self-deception, I gave myself credit for, but had not. My friends now only loved me without hope, and in the whole of the surrounding neighbourhood it was everywhere said that I was a lost man, and that nothing more could be done for me.'

(To be continued.)

—o—

Anecdotal Natural History.

BY REV. J. G. WOOD, M.A., F.L.S.

Author of 'Homes without Hands,' 'Nature's Teachings,' etc.

AND THEODORE WOOD,

Joint Author of 'The Field-Naturalist's Handbook.'

No. XIII.—THE MONKEY TRIBE.

PART I.

THE grotesque resemblance borne by the larger apes towards the human form has given rise to various conjectures regarding the relationship between man and the monkeys. Without, however, touching upon these speculations, with which we need not concern ourselves, we will examine the chief points of structure in which the two beings resemble, and also those in which they differ from, one another.

As a type of the tribe we will take the Gorilla (*Troglodytes gorilla*), as standing first in the family, and compare the respective skeletons of that animal and of a human being.

No second glance is needed to see the wonderful difference which exists between the bony framework of the man and that of the beast. The clumsy, brutal head of the ape, with its low, receding forehead, protruding cheek-bones, and massive jaws, is quite unlike the rounded skull of the man, with its upright forehead and small jawbone. Then the almost total absence of neck; the long, ungainly arms, with their enormous hands; the short, bowed legs, all insufficient to support the body upright; and the peculiar structure of the feet, suffice to prove, even without entering into further details, the immeasurable distance which separates the two beings.

As we proceed in our examination, this conviction is still more strongly forced upon us, every part of the frame bearing witness to the nature and habits of the beast, as opposed to those of the man.

Let us now examine the structure a little more closely.

We notice, in the first place, the great size and strength of almost every bone in the body, which at once informs us that the muscular power is proportionately developed.

This is the case to a singular degree in all the larger apes, the strength, more especially of the arms, being perfectly astonishing. M. Du Chaillu tells us that a gorilla has been seen to bend a gun-barrel double by means of the hands alone, grasping the weapon in the huge paws, and bending it without apparent exertion. He also remarks that, unlike most wild animals, the gorilla possesses scarcely more tenacity of life than man. The surest mode of killing this ape is, when it has turned to bay, to allow it to approach within two or three yards, and then to aim at the centre of its breast. It succumbs at once to the shot, and falls dead on its face, almost without a struggle.

The hinder limbs, too, are powerful in their way, the grasp of the foot, in particular, being very great. But when called upon to sustain the weight of the animal upon level ground, they are of comparatively little use.

This is not so much owing to the want of the requisite strength, as to the structure of the opposite extremities of the body, namely, the head and the hinder paws. Both of these are formed in such a manner that an upright carriage is impossible, the animal, even when at rest, being quite unable to assume a perfectly erect attitude.

When the structure of the head and feet is examined, this inability is easily accounted for.

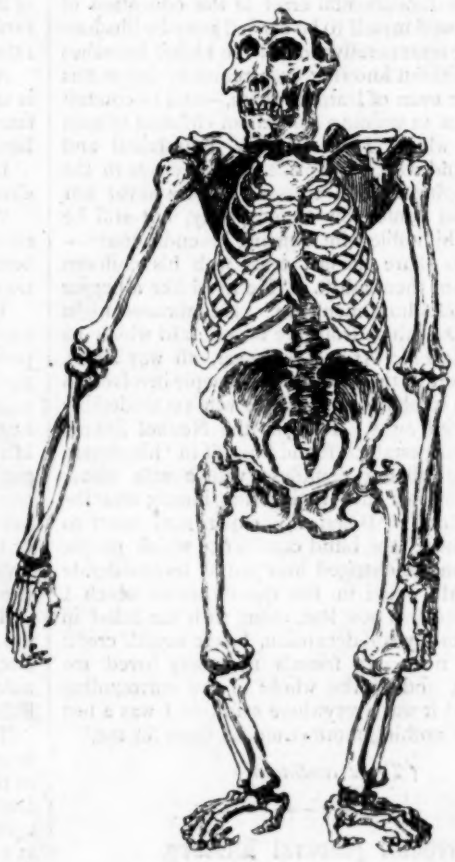
In the former, the 'occipital foramen,' or in plainer language, the orifice in the base of the skull through which the spinal cord passes to the brain, is placed so far back that the whole weight of the head is thrown forward, tending, of course, to overbalance the body. In man, this orifice is placed almost in the centre, so that the head is evenly poised upon the spinal column.

With regard to the feet, the cause is evident without the need of dissection, for these organs are formed almost exactly like hands, being provided with thumbs and fingers instead of toes. They are, in fact, almost identical in form with the hands themselves. Naturally, as they can possess no heel, and as there is no 'calf,' *i.e.*,

the set of powerful muscles below the knee, which are required for the working of the foot, these hinder hands cannot be placed flat upon the ground; an erect position is therefore rendered impossible.

In fact, when an ape endeavours to stand upright, the feet can only be placed sideways upon the ground. The movements are consequently so awkward and uncertain that the animal is obliged to assist itself in its progress by its arms, which are of such length that the fingers almost touch the ground when their owner is standing in as erect a position as he is able to assume.

The Orang-outan, indeed, one of the large apes, always uses these long arms as crutches when walking



upon a level surface, placing the knuckles of the hands upon the ground, and swinging the body between them.

Unfitted as is this structure, which is common in a greater or less degree to nearly all the monkeys, for locomotion upon land, it is not so for their movements in their natural home, namely, the forest. The immense strength of the arms, the hand-like structure of the hinder feet, and even the very form and attitude of the body, are as much adapted to an arboreal life as they are unsuited for an existence spent upon the ground.

Look at a monkey upon a level surface, for instance, as it travels awkwardly along, seeming, indeed, scarcely to know what to do with its limbs. Look at the same creature when it has gained the branches of some tree, and is making its way from bough to bough with an easy grace and agility which are as much opposed to its former ungainly motions, as are the evolutions of a swan when swimming from the movements of the same bird when it essays to travel upon dry land. In both cases, one would hardly recognise the awkward, clumsy animal for the agile, graceful creature which it subsequently proves to be; and even Caliban and Ariel are hardly more widely different both in movements and appearance, than is the monkey upon land from the monkey in the trees.

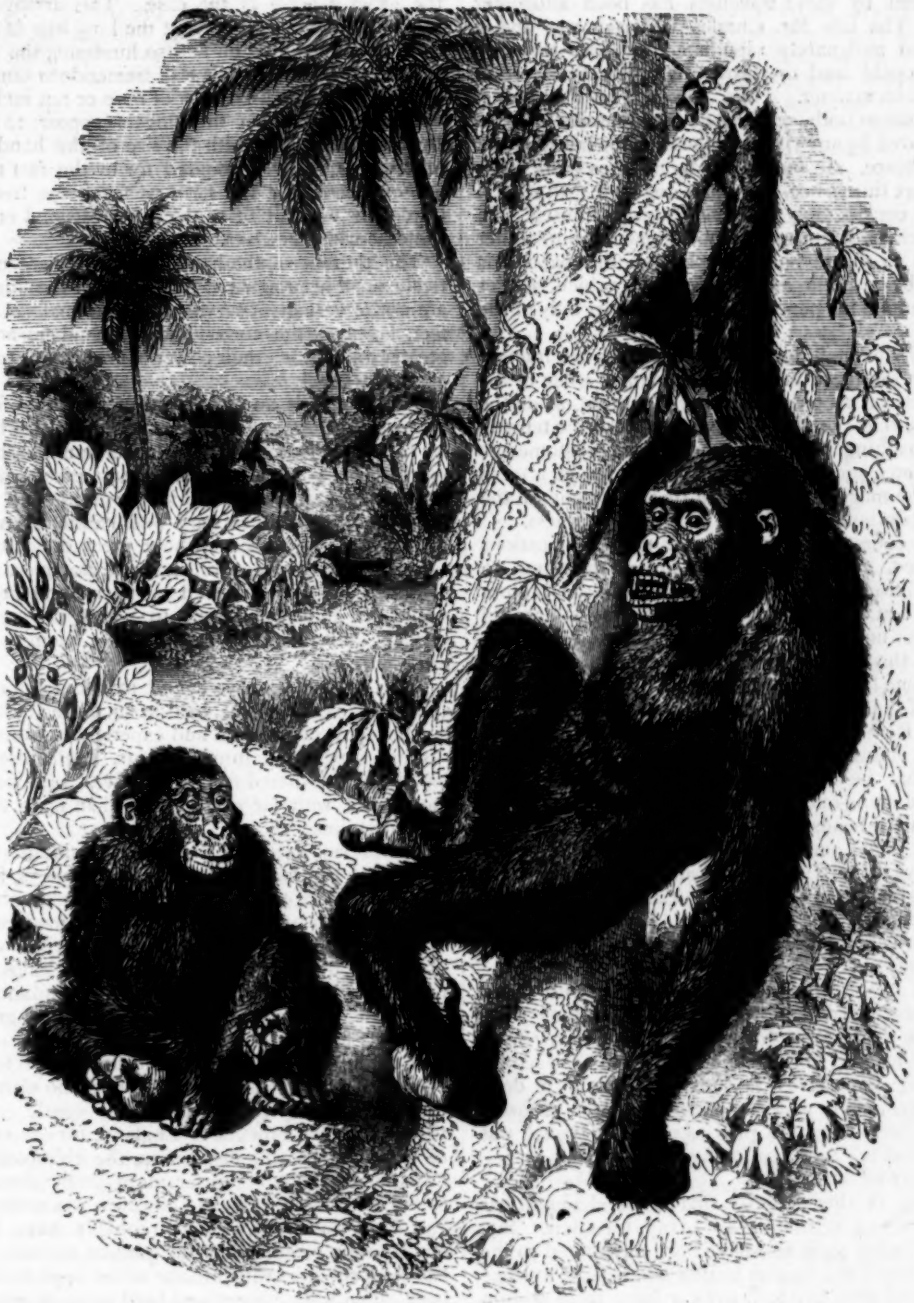
With the large apes, however, the difference is not so noticeable as with some of the smaller animals of the group—such, for example, as the Gibbons,—their huge weight and clumsy form debarring them from progressing among the branches with the speed and agility exhibited by monkeys more delicately and gracefully formed.

The structure of the head, more than all else, bears witness to the wide gulf separating the man from the beast. The jaws form the most prominent feature, protruding far in advance of any other part of the face; the teeth are more aptly to be described by the word 'tusks'; the nostrils are placed flat upon the face, the nose, which gives so much expression to the human countenance, being altogether wanting; and, more especially, the brain is very small in proportion to the other parts of the frame.

Naturally, the reasoning powers are developed only in a corresponding degree.

A very mistaken notion appears to prevail that monkeys are infinitely more clever and intelligent than other animals. True, they are crafty and cunning, few animals more so; but craft and cunning alone do not constitute intellect, and if the reasoning powers of the monkeys be fairly weighed, we shall find that they are far excelled by those of many animals very much lower in the order of creation than themselves.

Fortunate is it for mankind that the mental powers, at any rate of the large and powerful apes, are not equal to their physical qualifications. For were these animals to become aware of their vast strength, and also to be acquainted with the means of using it to the best advantage, they would become enemies whose powers of mischief could scarcely be over-estimated.



As it is, monkeys in their wild state do not seem to have very much idea of the use of a weapon. Occasionally, perhaps, one of these animals will lift a stick,

and even endeavour to strike with it. But he will have so little notion of using his strength, that the force of the blow given will be far less than if the arm and hand only had been used.

Again, their power of hurling missiles is very slight, and indeed by some travellers has been altogether denied. The late Mr. Charles Waterton was one of these, and indignantly repudiated the idea that any monkey could hurl or throw any object whatever in any possible manner. Here, however, he was wrong. That monkeys both can and do hurl missiles can be easily proved by any visitor to the monkey-house at the Crystal Palace. In one of the large cages there is, or was a short time since, a baboon, together with several monkeys considerably inferior in size to himself. In order to check his propensity for subjecting his smaller comrades to severe bodily castigation, this baboon is fastened by a chain around his body, which obliges him to confine his perambulations to a part only of the cage.

Naturally enough, his companions know to a fraction of an inch the reach of the captive animal when at the full stretch of his tether, and never venture inside the charmed circle. Unable, however, to resist the temptation of insulting the prisoner, they are accustomed to eat nuts, etc., presented by the visitors, an inch or so without the magic line, knowing that the sight of the coveted dainties will goad the captive to madness.

In the course of a few seconds their anticipations are fulfilled, and the infuriated animal attempts to revenge himself by hurling the straw from the bottom of the cage at his tormentors, plying them with armful after armful until the supply is exhausted. An exhibition of this nature can be generally produced by offering some little dainty to one of the smaller monkeys in sight of the captive baboon.

Mr. A. R. Wallace, also, the well-known traveller and naturalist, states, in his work upon the Malay Archipelago, that he has, upon three occasions at least, known the orang-outan to hurl down dead branches, etc., upon the heads of its pursuers. Other travellers also have made similar statements, so that the power of monkeys to hurl projectiles, although not perhaps with any great force or accuracy of aim, can no longer be doubted.

One mode of annoying foes upon the ground is a very curious one.

Taught by instinct, monkeys will never trust themselves upon dead branches. But when they have wished to drive away foes beneath them, they have been seen to hang from a sound branch by their hands, and swing themselves repeatedly towards a dead branch, striking it violently with their feet at every swing, and repeating the process until the branch was snapped and fell to the ground.

To return to our gorilla.

The size of this ape, like that of the elephant, has been greatly exaggerated by many travellers. Six, seven, and even eight feet have been mentioned as the height to which the animal attains, whereas the average is little more than five feet, even a large male seldom reaching five feet six inches in height. However, a monkey only five feet high is a very large animal, and when the breadth of body and length of arm, and the almost herculean strength of its limbs, are taken into account, it may easily be imagined that an infuriated gorilla is by no means an insignificant foe.

The hair is almost black in colour, appearing less dark, however, in some lights, and becoming of a greyish hue upon the cheeks and the top of the head. Upon the arms it is arranged in a very curious fashion, the hair from the shoulder to the elbow growing in a downward direction, while from the elbow to the wrist the exact reverse is the case. This arrangement is probably intended to prevent the long hair of the wrist from being included in, and so hindering the grasp.

The hand of the gorilla is of tremendous dimensions, often attaining to a breadth of nine or ten inches. To outward examination the fingers appear to be very short in comparison with the size of the hand. This, however, is easily accounted for by the fact that they are connected by the flesh as far as the base of the third joint, instead of to that of the second only, as is the case with ourselves.

The thumbs of the hands themselves are comparatively small in proportion to the size of the fingers, and are not of very great service to the animal. Upon the feet, however, the corresponding members are of far greater dimensions, their power of grasp being extremely great.

The gorilla is an inhabitant of the thick forests of that part of Africa known as the Gaboon, where it is far from uncommon. In spite of its numbers, however, several causes have prevented any great knowledge being gained with regard to its life and habits.

In the first place, so wary and cautious an animal cannot be approached without great difficulty, more especially in the dense forests in the gloomiest recesses of which it loves to dwell. The snapping of a twig would be amply sufficient to alarm the suspicious animal, and acquaint it with the vicinity of an intruder.

Then, again, the fierce and savage nature of the animal causes it to be held in such dread that none but the most courageous and experienced hunters will venture to penetrate into its haunts. Little information, too, is to be gathered from the natives, who look upon the animal with far greater fear than upon the most infuriated lion.

The prevailing idea of the native inhabitants appears to be that the large apes are not monkeys, but wild men, who retire to the woods and feign dumbness in order to avoid being taken captive and made to work. Some tribes also consider that the gorillas are animated by the souls of former savage kings, whose ferocity and love of slaughter continue undiminished.

The disposition of the gorilla alters very greatly at different periods of the animal's existence. While still young, before the savage instincts have had sufficient time to become fully developed, the character of the ape is comparatively mild and gentle. 'Gena,' the last gorilla brought to England, for example, was of a fairly peaceable disposition, the chimpansee who bore her company being far more prone than herself to fits of passion. 'Gena,' however, was quite young, and had she lived, would probably have become terribly morose and sullen by gradual degrees, just as has been the case with all the other apes which have been taken while young, and bred up in captivity. As the bodily powers increase, the mental attributes proportionately diminish, the intelligence of the baby ape being far superior to that of the adult animal.

Like many animals of the monkey tribe, the gorilla seldom lives for very long when kept in captivity. Its constitution seldom enables it to withstand the change of climate, and it inevitably succumbs, before many

months are over, to the great foe of the monkey race in this country, namely, consumption.

As to the habits of the gorilla in its purely wild state, it is not likely that we shall ever know much about them.

Its instinctive wariness enables it to detect the approach of an enemy at a considerable distance, and, like the elephant under similar circumstances, it can slip away so quietly that a traveller might pass through a spot which was tenanted by the apes only a few minutes before, and fancy that not a gorilla could be found within miles around.

Moreover, like the monkey tribe in general, the gorilla is ever on the move, so that a colony of these apes is an impossibility. The gorilla seems to live in families, and the whole family moves about together, led by the parents until the young are old enough to leave their parents and set up in life for themselves.

Again, the districts which these creatures inhabit are of such a character that no white man could live long enough to make trustworthy investigations, even if he succeeded in evading the vigilance of the apes. The pure West African negro might do so, but his intellect is quite inadequate to the task.

Nor is there much likelihood of watching their habits in captivity, as the European climate is quite unsuitable to the gorilla. It requires a temperature far above that which is needed by most monkeys, and it must have plenty of space and abundance of warm and constantly changing air.

The chimpansee 'Tommy' who lived for some years in the Crystal Palace, retained perfect health during his captive life, simply because Mr. F. W. Wilson, who took charge of him, fulfilled both these conditions. Had he not perished in the fire which consumed the tropical department, he might have been alive at the present time.

The gorilla, however, requires much more care than the chimpansee. When the young gorilla, 'Gena,' was at the Crystal Palace in August, 1879, she never seemed to be warm enough. Even at night, when put into her travelling cage and placed near a stove, she always pressed herself against the bars, and held her little black paws as close to the stove as they could reach.

The only plan whereby there would be any hope of preserving the life of a gorilla in this country would be to build a large and thick-walled house expressly for the purpose. An equable temperature of not less than 75° Fahr. would be required, and there must be an ample supply of air constantly driven through it.

Equability of temperature is a necessity. Once, at the Crystal Palace, while Gena was there, a sudden shower came on. A sharp N.E. wind was blowing, and the evaporation over the immense roof cooled the air so fast that the temperature fell more than 20° in a very short space of time.

Gena seemed to be quite paralyzed by the change, against which no one could have guarded, and indeed she never seemed to recover the shock. I had the opportunity of inspecting her after death, and saw that one lung was entirely useless and the other nearly so.

ANOTHER African ape is the Chimpansee (*Troglodytes niger*), which inhabits the same parts of Africa as the gorilla. Except in inferiority of size, it is by no means unlike that animal; for which, especially while young, it might easily be mistaken. Indeed, for many years the gorilla was thought to be nothing more than an adult chimpansee.

An unfailing point of distinction, however, may be found in the ears. These, in the gorilla, lie close to the head, and are as small and well-shaped as those of many a human being. In the chimpansee, however, these organs are of far greater size, and stand out boldly from the head, giving an expression to the face which at once distinguishes it from that of the gorilla.

Similar as they are in appearance, however, in habits they are very different. The gorilla is an inhabitant of the forest, like nearly all the members of the tribe, spending almost the whole of its existence among the branches, and only descending to the ground when obliged. But the chimpansee forms an exception to the general rule, and is a dweller upon the ground, taking up its abode in rocky and precipitous neighhoods. The title '*Troglodytes*' has been applied to the genus on account of the dwelling-places selected by this animal, that word signifying a 'diver into caverns,' and therefore being very appropriate.

It may be imagined that an animal dwelling in so comparatively exposed a situation would be particularly liable to the attacks of the larger *Carnivora*. No single chimpansee would be a match for a lion, or even for a leopard, for its strength, great as it is, would be of little use against the fangs and talons of its opponent.

However, the chimpansee, unlike the gorilla, which is more or less a solitary animal, recognises the principle that unity is strength, and accordingly congregates into small flocks, the members of which combine for purposes both of offence and defence. Not even the elephant, huge and powerful as it is, can stand against the onslaught of a band of these animals, which can collectively bid defiance to any foe excepting man himself.

Like most animals which congregate together for mutual protection, the chimpansees post sentinels at intervals round the camp, in order to give early warning of the approach of any foe. Should an enemy be seen, the nearest sentry gives notice of the impending danger by means of a sharp, shrill cry, the meaning of which is perfectly understood by every member of the band. A conversation is then kept up, in the peculiar barking cry of the animals, until the onslaught takes place, or the foe listens to the dictates of prudence and retraces his steps.

According to the reports of the natives, the chimpansees construct huts for themselves, which are inhabited by the females and the young, the males keeping guard upon the roof. These stories have not as yet been verified; but as the orang-outan, a closely-allied ape, is known to weave similar structures in the trees, there is at least a likelihood that such may be the case with the chimpansee. One species of chimpansee certainly does construct a roof, under which it sits.

The food of the chimpansee seems to be entirely of a vegetable nature, the animal subsisting chiefly upon fruit of various sorts. Consequently, it is a terrible foe to agriculturists who are unfortunate enough to possess plantations near the haunts of the animal, the apes stripping them of their produce as soon as the fruit ripens.

The chimpansee appears to be a somewhat long-lived animal, as it does not attain to maturity until after attaining the age of nine or ten years. A speci-

men has been known to live for twenty-one years in captivity, and it is probable that this period would have been considerably extended had the animal been allowed to remain free and unfettered in its native haunts.

(To be continued.)

—o—

Practical Lessons on Insect Life.

BY THEODORE WOOD, M.E.S.,

Joint Author of 'The Field Naturalist's Handbook.'

No. XI.—THE LEPIDOPTERA. Part I.

THE butterflies and moths form the order scientifically termed *Lepidoptera*, which is placed next upon the list. This name signifies 'scale-winged,' and is applied to the insects of the group on account of the scales with which both the upper and under surfaces of the wings are closely covered. The structure of these scales has already been explained in the third of this series of papers.

The most important of the remaining characteristics of the group is found in the structure of the mouth, which is formed for suction only. The mandibles, or outer jaws, are rudimentary only, and scarcely visible without close examination. The maxillæ, or inner jaws, however, are developed to a very great extent, and form a long trunk, or proboscis, through which liquids can be sucked into the mouth. When not in use, the proboscis is coiled away beneath the head.

The Lepidoptera are generally considered to form two natural groups, known respectively as butterflies and moths, the members of the former being distinguished from those of the latter by their clubbed antennæ, by the form of the body, and by the position of the wings when the insect is at rest.

As far as the British Lepidoptera are concerned, these distinctions are amply sufficient to separate the insects of the one group from those of the other, the clubbed antennæ alone being a sufficiently marked characteristic.

But, when we come to examine the insects of other parts of the world, we find that these points of difference no longer hold good. Many exotic moths, for instance, possess antennæ far more strongly and distinctly clubbed than those of most butterflies, while those organs in several genera of the latter insects are as plain as is usually the case with the moths. The form of the body, too, can no longer be relied upon as a distinguishing feature, and there is really no characteristic which can be decided upon to invariably separate the insects of the two groups. It is, therefore, considered by our leading authorities that the Lepidoptera form one large group only, divided into a number of smaller families. In the present paper, however, as the Lepidoptera of our own country can alone be described, we shall still consider the insects as being divided into two great sections.

The butterflies are divided into five families, which are distinguished chiefly by the veining of the wings, the form of the antennæ, and, more particularly, by the development of the legs. For, in many butterflies, the first pair of these organs are so short and imperfect as to be quite unsuitable for the purpose of walking, and it is even doubtful whether they fulfil any functions whatever. So small are they, indeed, that to a careless observer they would be totally invisible. The structure of both the larva and pupa are also taken into account.

The first of these five groups comprises the *Papilionidæ*, the members of which, although, with one exception, few and insignificant in this country, attain to great size and beauty in tropical lands.

The beautiful Swallow-tail Butterfly is our one representative of tropical magnificence, and even this solitary example seems likely before very long to become extinct as far as Great Britain is concerned. It is found in marshy land only, and is almost entirely confined to the fens of Cambridgeshire, Norfolk, and Huntingdonshire. In some parts of these counties it is still found in tolerable plenty, although the draining of the marsh-land, combined with the attacks of insect collectors, is rapidly diminishing its numbers.

The most familiar insects of this family are the 'White' butterflies, so plentiful in every part of the country from early spring to late autumn. These butterflies are the parents of the caterpillars which devastate our cabbage-crops, and which are in consequence held in the greatest detestation by the agriculturist. Indeed, were it not for their untiring foe, the little Ichneumon-fly (*Microgaster*), it is doubtful whether a single cabbage-plant would be free from their attacks. The labours of this little fly, indeed, deserve our warmest gratitude, for, thanks to its ravages, the most important of these butterflies, namely, the Large Cabbage White, is now comparatively scarce, hardly a single specimen being now seen where formerly the insect existed in thousands.

As an instance of the multitudes in which the larvæ of this butterfly have sometimes appeared, the following extract from Coleman's 'British Butterflies' may be of interest:—

'A note in the "Zoologist," p. 4547, by the Rev. Arthur Hussey, gives us the following:—"For the last two summers many of the gardens of this village have been infested by caterpillars to such an extent that the cabbages have been utterly destroyed." When the time for changing to the chrysalis state arrived, the surrounding buildings presented a curious appearance, being marked with long lines of the insects travelling up the walls in search of a suitable place of shelter for undergoing their transformation. A great number of caterpillars took refuge in a malthouse, from which they could not escape as butterflies, the result being that for several weeks the maltster swept up daily many hundreds of the dead insects.'

In the same work an instance is given of the valuable services rendered to man by the *Microgaster* in destroying these larvæ.

'In 1842,' says Mr. Coleman, 'a vast flight of white butterflies came over from the Continent to the coast about Dover, and, spreading inland from thence, did an immense amount of damage to the kitchen gardens; but so effectually did the ichneumon flies do their work, that an exceedingly small proportion of the caterpillars resulting from this flock of immigrants went into the chrysalis state, nearly all perishing just before the period of change.'

Various small birds also contribute largely to the destruction of these caterpillars, which they devour in great numbers.

The eggs of this butterfly are very curious objects, being shaped something like skittles, each egg standing upright, and deposited in little clusters of ten or

twelve. When placed under the microscope, these eggs are seen to be covered with a raised pattern, a number of bold ribs running from top to bottom, while a series of raised transverse lines pass over both ribs and interstices. These eggs may generally be found by examining the leaves of the cabbages in May and August, the butterfly being double-brooded.

The chrysalis is suspended by a thread round the middle to any convenient object, such as a post or wall.

The Smaller White Butterfly, now by far the more abundant of the two insects, is, in one way, even more destructive than the preceding insect, for the larva bores into and devours the very heart of the cabbage, while that of the larger white is contented with the outer leaves. Consequently, it is not so readily detected and destroyed, being concealed from the view of most of its enemies.

To this group also belongs the beautiful Brimstone Butterfly, which is so common throughout the year in most parts of the country.

The next family, that of the *Nymphalidæ*, comprises a considerable number of species, comparatively few of which, however, possess special interest to any but an entomologist. Among these exceptions, however, we may mention the insects of the genus *Vanessa*, which includes the beautiful Peacock and Scarlet Admiral Butterflies, the Tortoiseshell, and some others.

Most of the Vanessas feed, while in the larval state, upon the leaves of the common stinging-nettle, which they roll up in order to form a hiding-place where they may be concealed from the view of their enemies. The chrysalis is always suspended by the tail, and is, in all the species of the genus, a very beautiful object, being plentifully adorned with gilded spots, looking like so many patches of gold leaf.

These butterflies emerge from the chrysalis at the beginning of autumn, and pass the winter, in a state of torpor, in some sheltered retreat. Old barns, church towers, hollow trees, etc., are usually resorted to by numbers of hibernating butterflies, which remain motionless until the warmer days of spring tempt them once more to exercise their wings.

But their demeanour is then entirely changed. During the few weeks which intervened between their release from the pupal shell and their retreat to their winter's hiding-place, their occupation was solely that of seeking amusement, or extracting the sweet juices from various honey-bearing flowers. But as soon as spring arrives, they enter upon the serious business of their lives, viz., that of providing for a future progeny, and the female butterflies, worn and battered in their passage through life, may then be seen flitting slowly along the roadsides in search of some convenient spot in which to deposit their eggs. This done, their work is over, and they seldom survive the operation for more than a few hours.

The Scarlet Admiral Butterfly is perhaps the most generally known of these insects, its broad black wings, with their stripes of brightest red, being familiar to almost every resident in the country. It may sometimes be seen in countless numbers, resting upon the blossoms of the ivy-bushes on a sunny morning, in company with others of the same genus. In such a case, the effect of the mass of black and crimson wings, slowly opening and closing as their possessors regale upon the sweet juices, is almost magical.

One of the families of butterflies, the *Erycinidæ*, although numbering many members in foreign countries, possesses only a single representative in Great Britain. This butterfly, quite a small species, bears the somewhat lengthy title of 'Duke of Burgundy Fritillary.' It is a curious fact that the males of all the insects of the family have four fully-developed legs only, while the females possess the normal number of six.

Remarkable for the bright, metallic tinting of their wings, the Blues and Coppers are included in the

Scarlet Admiral.

family of the *Lycænidæ*. In these all six legs are fully developed in both sexes. In common with the Skipper Butterflies (*Hesperidæ*), these do not possess any great general interest, and we will therefore proceed to the second great section of the *Lepidoptera*, which includes those insects popularly known as Moths.

In these insects there is far more variety in shape and size, at least as far as our British species are concerned, than in the butterflies. Indeed, the antennæ alone of the insects comprising the group are sufficiently diverse in form to have earned the title of *Heterocera*, *i.e.*, 'varied horned,' for the section.

The first family of these insects, the *Sphingidæ*, consists of the large Hawk-moths, which form a very distinct group. The scientific title was derived from the fanciful likeness supposed to exist between the larvæ of these moths and the Egyptian sphinx.

Although this resemblance is not very striking to an ordinary eye, the larvæ are yet very interesting creatures, furnishing, on account of their large size, very suitable objects in which to watch the life-history of the Lepidoptera. They nearly all possess upon the upper surface of the twelfth segment of the body a curious curved horn, the object of which is altogether unknown. That it cannot be intended as a weapon either of defence or offence is evident enough, for the substance of which it is composed is not sufficiently firm to allow it to cause the slightest harm, even to the most sensitive skin.

The popular term of 'Hawk' moth is appropriate enough, for, both in form and flight, these insects strongly resemble the birds after which they are named. With such remarkable speed, indeed, do they pass through the air that the eye cannot follow their movements, the insects seeming to vanish and reappear as if by magic. Most of them are nocturnal in their habits, and may be seen hovering over flowers at dusk.

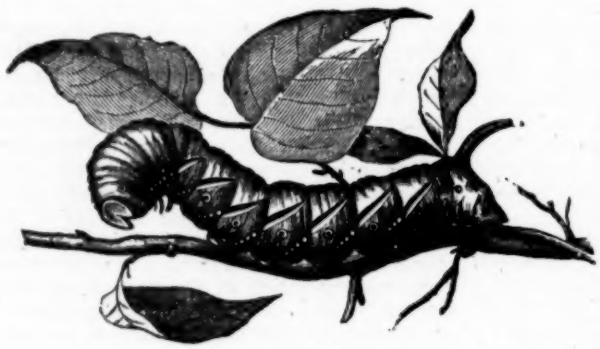
Our largest British moth, the Death's-head Hawk, is the most prominent member of this family, and attains to a very considerable size, a large specimen being often as much as five inches in expanse of wing. The caterpillar too is of very great size, and is found in potato-fields, that plant constituting its food.

It is, however, often found upon the jessamine, and, as a rule, a caterpillar which is found upon jessamine will not eat potato, and *vice versa*.

Owing to the curious skull-like mark upon the thorax, from which the insect derives its name, the Death's-head Moth has been, and still is, regarded with superstitious views by the uneducated portion of the community. Its advent is thought to presage death or misfortune, and the insect is consequently regarded with great awe and terror. Its peculiar faculty of uttering a shrill squeak when alarmed is almost invariably considered as a proof of its supernatural attributes.

The method in which this sound is produced has never been satisfactorily cleared up. Some observers have thought that it is caused by the friction of the palpi with the proboscis, others by the movement of the head against the thorax, and so on. Neither of these theories, however, will hold good when we take into consideration the fact that the sound is produced, not by the perfect insect alone, but also by the larva, and, more curious still, the pupa. The *modus operandi*, therefore, of producing the squeak employed by the insect during the various stages of its existence, has still to be determined.

It is currently reported in the south of France, where the insect is abundant, that the death's-head moth is in the habit of making its way into the bee-hives in order to feast upon the honey contained in the cells.



Larva of Privet Hawk-moth.

Want of space permits us to mention one more moth of the hawk tribe only, and we will therefore select the aptly-named Humming-bird Hawk-moth. This insect so closely resembles, both in form and habits, the little bird whose name it bears, that even residents in the tropics, who have been acquainted with humming-birds from their earliest childhood, have been deceived by the wonderful likeness borne to those birds by the hawk-moths. This resemblance is still further increased by the habit of the hawk-moth of hovering over the flower while extracting its juices, the humming-birds themselves feeding in exactly the same manner.

This is one of the swiftest of the tribe when upon the wing, vanishing and re-appearing with the rapidity of lightning. It is common in most parts of the country, and differs from nearly all the members of the family in that it flies by day instead of by night.

Next to the hawk-moths most authors place the *Sesiidæ*, or Clearwings, insects whose wings are only partly covered with scales. One of our leading authorities, however, considers that they are out of place in their present position, and removes them to a totally different group.

The greater number of these clearwing-moths bear so close a resemblance to bees, wasps, gnats, etc., as to deceive any but an experienced entomologist. The larvæ are all 'internal' feeders, in other words, they live inside the roots, stems, twigs, or even the solid wood itself, of various plants and trees.

The next family, the *Zeuzeridæ*, is a very small one in this country, consisting of two species only. Both are wood-boring insects while in the larval state, the more familiar of the two being especially interesting.

This is the well-known Goat-moth (*Cossus ligniperda*), so-called from the odour proceeding from the burrows of the larva, which somewhat resembles the scent of the he-goat. The perfect insect, although common, is not very often seen, being of a very sluggish temperament, and seldom stirring forth until after dark.

The larva feeds upon the solid wood of various trees, such as the oak and the willow, frequently causing great damage by its network of burrows. Its jaws are admirably fitted for their duties, for they are so powerful that scarcely any substance short of iron or tin will withstand their attacks. These caterpillars have even been known to perforate sheet-lead, so it may be easily imagined how rapidly the wood upon which they feed is cut away by their powerful mandibles.

By a curious provision, the pupa of this insect, as well as that of its congener, is able to travel along its tunnels with considerable speed. The edge of each segment is furnished with a row of little hooks, by the aid of which the pupa can wriggle itself along almost as rapidly as when in the caterpillar state. Just before the perfect insect emerges, the pupa travels in this manner to the mouth of the tunnel, in order that the moth may not be incommoded by want of space.

The development of this insect extends over a considerable period of time, the larva alone requiring four years in order to complete its growth. The egg from which it springs is deposited by the parent insect deeply in the bark of the tree by means of her long ovipositor, the little caterpillar travelling into the wood immediately it is hatched. From the time it is hatched until it attains the pupal condition, it never seems to cease feeding. Consequently, a tree attacked by these larvæ is so weakened by the combined attacks of the caterpillars, sixty or seventy of which are often found in the same trunk, that it dies as surely as if the woodman's axe had laid it low. So plentiful and widely-spread is the insect, that it is hardly possible to find a row of willow-trees several of which do not exhibit signs of the presence of the destroyer, while many a noble tree is so riddled by the tunnels that scarcely a cubic inch of sound wood is to be found in the trunk.

(To be continued.)

'How I Teach Elementary Science.'

BY RICHARD BALCHIN,

Head Master of the Gloucester Road Board School, London.

FOURTH-SCHEDULE SUBJECTS: 'MECHANICS.'

IN this article I will reproduce one of the lessons upon force, work, energy, and machinery. There seems to be a little vagueness in the use of some of these terms by even our leading men of science. Professor Guthrie, for instance, uses the term 'energy' not quite in the sense that Tyndall uses it. In most of the little text-books read in our schools there is, however, very considerable confusion, and other words are introduced, such as 'power,' 'strength,' etc., to which no very definite meaning is attached. All this tends greatly to the bewilderment of both scholars and teachers. In my lessons I endeavour to keep to the sense in which Grove, Tyndall, and Huxley use them.

Look, boys! I have taken my knife, and am making a point to this piece of chalk. What do you see is happening to the particles of chalk? Ans.—They are falling to the ground. Where were they before they fell? Ans.—On to the piece of chalk. What kept them there? Ans.—The attraction of cohesion. What made them come away from the stick of chalk? Ans.—The knife. The knife? Ans.—Yes, sir. Then what did *I* do? Ans.—You moved the knife up and down. (A boy)—It was you, sir, and not the knife, that made them come off. (Another boy)—It was the knife, because you could not cut them off without a knife. (The previous boy)—Yes; but the knife could not cut them off without you. Well, Jones, you seem to be thinking very deeply, what do you say? Ans.—Well, sir, I was thinking that it was not you nor yet the knife that made them come off: it was the power you put into the knife. (A boy)—It was the force of your arm, sir. Quite right, Howell, my boy. Now what do we call that force? Ans.—Muscular force. What was it, therefore, that this muscular force did? Ans.—Moved the knife up and down. And what resulted from that? Ans.—The particles of chalk came off. Then what did the muscular force accomplish in the end? Ans.—Cutting away the chalk. Yes: we will call that the 'work' that was done. Now let us go over this again. What is the work to be done? Ans.—Cutting away the chalk. What is the force employed? Ans.—Muscular force. Now what duty does the knife perform in all this? Answers—It is the thing you use. It is the instrument. It comes between the force and the work. Very good, Smith. (A boy, Jones)—It connects the force applied with the work to be done. That's capital, Jones: is that sentence your own? Ans.—No, sir: I read it in a book. (A boy)—Please, sir, what Jones says is what a *machine* does. Indeed! is it? Ans. (same boy)—Yes, sir: it says, 'A machine connects the force applied with the work to be done.' Well, don't you agree with that? Ans.—No, sir: a knife is not a machine. Indeed! why not? Ans.—Because it has no wheels, and bands, and things of that sort, and it does not go by steam. Well, let us stop a minute or two to see what a machine really is. Here we have a picture of the 'striking mechanism of a clock.' Now tell me what is the work to be done in this case? Ans.—The hammer striking against the bell. And what is the force employed to accomplish this? Ans.—That weight going down. Yes; but what causes the iron weight to go down? Ans.—The attraction of gravitation. Is that a force? Ans.—Yes, sir. Why? Because it causes motion. Well, now, what comes between this force and the hammer? Ans.—All those wheels and things. Exactly so; and what do we call all those wheels? Ans.—The machinery. Here, again, is a picture of what we call the 'mechanical powers.' We shall have a great deal to say about them next year. You see the representation of a man lifting a log of wood? Ans.—Yes, sir. What is the force he uses to do this work? Ans.—The strength of his arms. Yes; muscular force. You see he does not put his arms round the log and lift it that way: can you tell me why? Ans.—He is not strong enough. Yes; or, in other words, he has not sufficient muscular force. Well, what is he using? Ans.—A bar of iron, a crow-bar. Yes: that is called a 'lever.' Now what is it that connects the force applied, which is muscular force, with the work? Ans.—A lever. What, therefore, is a lever? Ans.—A machine. Yes; it is called a 'simple machine;' and you see, Smith, it has no wheels nor bands, and does not go by steam. Last Saturday I saw at the gas-works, Kent Road, a steam-engine at work, raising immense boxes of gravel and sand from a great depth. (A boy)—Yes, sir: my father works there, and they got up some tremendous tusks and bones of elephants. Yes, I know: they were bones of the 'mammoth;' but we won't go into that now. What was the force employed here? Ans.—Steam. (A boy putting up his hand.) Well? Please will you give us a lesson some day about those bones, how they got in the gravel? Yes, I will; but never mind about that now. You say that steam was the force employed. That is only partly right. Ans.—The expansive force of steam. Ah, that is better. But what caused the expansion? Ans.—Heat. Therefore, what was really the force employed? Ans.—Heat. Yes; and you have heard me say that the heat force in the coal came first of all from the sun; but we won't go back so far as that. We will say that the force applied was the expansive force of steam. What is the work to be done? Ans.—Lifting up the gravel. And what connects the force with the work? Ans.—The machinery. Yes. Here, Smith, we have wheels, and bands, and things of that sort. Do you think we could apply this force without anything coming between? No, sir. Now just think. Could we use steam, without the machinery, to send all this gravel to the top? (A boy)—Yes, sir; we could. How? We might put the boiler down the hole underneath a box of gravel, then make the water so hot that the boiler burst, and the gravel and all the other things would all be blown up to the top. (A boy)—Please, sir, that wouldn't do. No: that would be very inconvenient, still it would be getting the gravel to the top. But do you know of any instance where the force *is* applied without anything coming between? No answer. Well, how do they get the great blocks of stone from the rock in the quarry? Ans.—By blasting. What *is* blasting? Ans.—A hole is bored in the rock, some gunpowder is put in and then lighted, and the great blocks of stone are blown off. Very good; and when force is applied in this way we say it is applied 'direct.' This is, however, very seldom the

case; generally something connects the force with the work, and then we say the force is applied 'indirect.'

Have any of you ever seen a water-wheel? I see not many of you have. Well, here is a picture of a water-wheel and a flour-mill. What do you think is going on in that little house? Ans.—Grinding corn. Yes; that is the work. Now what is the force employed here? Ans.—The force of that water coming down the mountain. But what gives the water this force you speak of? Ans.—Coming such a long way down the hill. Then if it did not come such a long way wouldn't it have so much force? Ans.—No, sir. Just explain what you mean. Ans.—If you had the mill much higher up the mountain, just where the stream begins, there would be very little force, not enough to turn the wheel. Well? Ans.—And if you took the mill nearer to the bottom of the mountain there would be ever so much more force. (A boy)—Please, sir, that would be because there would be ever so much more water. How would there be more water? Ans.—Because other streams would join it. (The previous boy)—What would be the use of having ever so much more water if it didn't run? you might have ever so much water at the top, but if it didn't run it would do nothing. Now, Jones, don't get angry: let us try to get at the truth about it. You have said there is a force in the water; that the farther the water has run down the hill, and the more there is of it, the greater the force is. Let us think about this. (A boy holding up his hand.) Well? Ans.—Please, sir, there is not any force in the water at all. Oh, indeed! then *you* disagree with all that has been said? Ans.—Yes, sir. It's the force of gravitation acting upon the water and making it come to the bottom: it's the weight of the water. (Another boy)—It is not only because there is more water at the bottom that makes it have more force. What makes you think that? Ans.—Because if there were only the same quantity of water running at the bottom as near the top, it would still have greater force. Why? Ans.—Because it has been running down a greater distance. (A boy)—Please, sir, in the last lesson you told us about a hoop running down a hill: is this about water the same? But what did I tell you that the hoop running down a hill was an instance of? Ans.—Accelerated velocity. (A boy putting up his hand.) Well? Ans.—Can you have accelerated force? Yes, you can; and that is a very sensible question. But at present I shall say nothing about that: we will go into the subject of accelerated force, as you call it, when we have a lesson upon 'momentum.' What is really the force which causes that water to run down the mountain? Ans.—The attraction of gravitation. Yes; that is the force which is applied to do the work of grinding the corn.

Now suppose somebody had a spite against the man at the mill, and so went higher up the mountain, and placed a quantity of stones and earth in the bed of the stream, so as to block it up: what would happen? Answers—The water-wheel would stop. The stream would not come to the mill. The miller would come out and see what was the matter. And what would he find *was* the matter? Ans.—That the force had stopped. Indeed! what force? Ans.—The force of the water. But what have we just said that really was? Ans.—The force of gravitation. Then do you mean to say that the force of gravitation had stopped acting? Ans.—No, sir: it is still acting. Upon what? Ans.—Upon the water on the other side of the stones. Now I want you to think carefully. Tell me what is the difference between the action of this force *now* that the stream is blocked up, and *before*, when it caused the water to turn the mill. (A pause, during which every boy is thinking. Surely a moment of delight in the life of a teacher, whose own psychic force is reflected from every eye.) Answers—The force is acting, but it is not grinding the corn. Before, the force did work: now it does nothing. There is more and more force getting in the water on the other side of the wall. (A boy raises his hand.) Well? Ans.—If the stones and things were knocked away, and all the water came rushing down, it would do more work than it did before. You think it would? Yes, sir: it would make the wheel go round very fast. (Another boy)—I don't think it would do any work at all: it would wash the mill and the wheel all down to the bottom of the hill. Very well; now I will take one or two of your answers, and see what we can make of them. It was you, Johnson, I think, who said there was more and more force getting in the water on the other side of the stones: what makes you think so? Ans.—Because the water is getting higher and higher. (A boy)—The man must keep on bringing more and more stones. Why? Ans.—If he did not, the water would soon have power enough to break down the wall altogether. How did the water get this power that you speak of? Ans.—By the force of gravitation. Now what word would you use when speaking of more and more things collected together, such, for instance, as more and more stones? Ans.—A heap; an accumulation; a collection. Just so. Now what is there an accumulation of in the mass of water? Ans.—Force. And what is force able to accomplish? Ans.—Work. I will now write on the board a name for such an accumulation of force, or such a store of power to do work—'Energy;' and this is its meaning, 'power to do work.' (A boy)—Please, sir, is it called 'energy' when it does work? Ans.—Yes, certainly. (Same boy)—Then energy is the same as force. (Another boy)—No; it is not the same: energy is a lot of force that has been stored up, and then all coming out. (A boy)—It is energy before it does come out. The fact is we want words to describe all this. It is not quite right to talk about 'energy coming out;' still you have, I think, the correct idea. If the energy exists, but is not in operation, like the energy in the mass of water still on the other side of the wall, we say it, that is the water, has 'potential energy,' which I will write down on the board; but if we knock down the wall, and allow the energy to operate in performing work, we then say the energy is 'actual.' Now, boys, our lesson has been rather a long one. Just take out your exercise-books and write these definitions:—Force is that which produces or tends to produce motion, or changes or stops motion. Work is the result of the application of force. Machinery is the apparatus for conveniently connecting, and passing on, the force applied with or to the work to be done. Energy is the power to perform work, stored-up force. If the energy is in operation it is termed 'actual energy:' if it exists, but is not in operation, it is called 'potential energy.'

—o—

ANSWERS TO

Pupil Teachers' Examination Paper.

JANUARY 28TH, 1882.

CANDIDATES.

Three hours and a half allowed.

Arithmetic.

MALES.

1. How much will it cost to travel 715 mls, if it costs 3s. 4½d. to go 11¼ mls.?

11¼ mls. : 715 mls. :: 3s. 4½d. : cost required.

$\frac{161 \text{ far.} \times 1430}{23} = 10010 \text{ far.} = £10\ 8s.\ 6\frac{1}{2}d.$ Ans.

2. Neglecting fractions of a farthing, find the value of 2,002 acres, 3 roods, 4 poles, 5 yards at the rate of 11 guineas per acre.

			£	s.	d.
Value of	1 ac. =		11	11	0
					10
,,	10 ,, =		115	10	0
					10
,,	100 ,, =		1155	0	0
					20
,,	2000 ,, =		23100	0	0
,,	2 ,, =		23	2	0
,,	2002 ,, =		23123	2	0
,,	2 ro. = ½	val. of 1 ac. =	5	15	6
,,	1 ,, = ¼	,, 2 ro. =	2	17	9
,,	4 po. = 1/40	,, 1 ,, =		5	9¼
,,	5 yds = 1/160	,, 1 ,, =			2¾ 80/160
	Value of whole =		£23132	1	3 80/160.

3. Find cost of 263 tons, 7 cwt., 0 qrs., 14 lbs., 15 oz. at 10s. 10d. per oz.

(*a*) 263 tons, 7 cwt., 14 lbs., 15 oz. = 9438703 oz.

		£	s.	d.
(*b*) Total value at £1 per oz.	=	9438703	0	0
,, ,, 10s. = ½	val. at £1 =	4719351	10	0
,, ,, 10d. = 1/12	,, 10s. =	393279	5	10
Total value at 10s. 10d. per oz.	=	£5112630	15	10

4. Working 10 hours a day, it takes 15 labourers 18 days to get through 450 yds. of a trench. How many men, working two hours a day, would in 8 days finish 480 yds.?

2 hrs. : 10 hrs.
8 days : 18 days
450 yds. : 480 yds.
} :: 15 labourers : men required.

15 lab. × 10/2 × 18/8 × 480/450 = 15 × 12 = 180 men. Ans.

FEMALES.

1. Find the cost of 1398 articles at £3708 9s. 10½d. each.

		£	s.	d.
Value of whole at	£1 each =	1398	0	0
				3708
		11184	0	0
		978600	0	0
		4194000	0	0
,, ,,	£3708 ,, =	5183784	0	0
,, ,,	10s. = ½ val. at £1 =	699	0	0
,, ,,	£3708 10s. =	5184483	0	0
Subtract val. of whole at 1½d. = 1/12	of val. at £1 =	7	5	7½
∴ exact value of 1398 arts. =		£5184475	14	4½

2. A clerk having to pay 1000 workmen £1 5s. 4½d. each, receives from his employer £1000 for this purpose, and this, together with £9 18s. 6d. of his own, he expends in paying each man in full as far as the money goes; how many men remain unpaid?

(*a*) Number of men paid = (£1009 18s. 6d. ÷ £1 5s. 4½d.) = 484764 halfd. ÷ 609 halfd. = 796 men.

(*b*) ∴ 1000 − 796 or 204 men remain unpaid. Ans.

3. Make out the following bill:—1 cwt. of tobacco at 2½d. an ounce, 2 tons of sugar at 4½d. per lb., 3½ cwt. of treacle at 1½d. per lb., 2¾ cwt. of cheese at 6s. 9d. per doz. lbs., a tub of butter (containing 74½ lbs.) at £4 18s. per cwt.

	s.	d.		£	s.	d.
1 cwt. at	0	2½	per oz. =	16	16	0
2 tons at	0	4½	,, lb. =	84	0	0
3½ cwts. at	0	1½	,, lb. =	2	0	10
2¾ cwts. at	6	9	,, doz. lbs. =	8	13	3
74½ lbs. at	98	0	,, cwt. =	3	5	2½
				£114	15	3½ Ans.

4. Find the value of an estate of 1343 acres 3 rds. 19 po. at £42 3s. 4d. an acre.

		£	s.	d.
Value of 1 ac. at £1	=	42	3	4
,, 1343 ac. = (£1343 × 42¼)	=	56629	16	8
,, 2 ro. = ¼ val. of 1 ac.	=	21	1	8
,, 1 ,, = ½ ,, 2 ro.	=	10	10	10
,, 20 po. = ½ ,, 1 ro.	=	5	5	5
		56666	14	7½
Take off ,, 1 po. = 1/20 ,, 20 po.	=		5	3½
∴ exact val. of estate =		£56666	9	3½

Grammar.

1. Parse the verbs and adjectives in the following:—

'Toll for the brave!
The brave that are no more;
All sunk beneath the wave
Fast by their native shore.'

Toll—reg. trans. verb (used here as intrans.) imper., pres., 2nd per. plur., agreeing with (*you*).
brave—adj. qual. (*men*) here equal to a noun.
brave—adj. qual. (*men*), emphasizing first *brave*.
are—irreg. subst. verb *am, was, been*, indic., pres., 3rd pers. plur., agreeing with *that*.
sunk—complete part. of irreg. intrans. verb *sink, sank, sunk* referring to *all*.
their—poss. adj. limiting *shore*.
native—disting. adj. limiting *shore*.

2. Define clearly an abstract noun; give examples.

An 'abstract noun' is the name of a *quality* considered apart from the thing with which it is connected, or of an *action* considered apart from the doer of that action, or of the *state* of any common or proper noun. That which is denoted by an abstract noun has no independent existence, but is only *thought of by* itself.

Abstract nouns are formed from (1) adjectives; *e.g., goodness, whiteness, fruitfulness.* (2) Verbs, *e.g., laughter, speech.* (3) Concrete nouns, *e.g., tyranny, boyhood.*

3. Give examples (1) of nouns having two plurals; (2) of nouns that admit of no plural.

(1) Some nouns of foreign extraction have both an English and a foreign plural, with different shades of meaning, *e.g., genius, genii* and *geniuses; index, indexes*, and *indices; formula, formulæ*, and *formulas.* Some A. S. words give two plurals:—*brothers* and *brethren; cloths* and *clothes; dies* and *dice; pennies* and *pence.*

(2) Some nouns, from the nature of their signification, do not admit of a plural. These are names of *materials*, as, *gold, silver, clay, timber; abstract nouns*, as *temperance, wisdom, compassion.* Many of such nouns are used in the plural to denote different kinds or instances of the substances or qualities referred to.

Geography.

1. Name in order the river mouths, bays, headlands, and principal seaports between the Firth of Clyde and the Bristol Channel. Describe briefly the character of each seaport.

On the Firth of Clyde are the seaports of *Greenock*, with shipbuilding and sugar-refining, and *Port Glasgow*, with shipbuilding. Proceeding southwards, we pass *Ardrossan*, with steam to Ireland, *Mouth of the Irvine, Ayr Bay*, with *Ayr* at the *Mouth of the Ayr, Turnberry Point, Girvan* at the *Mouth of the Girvan, Loch Ryan, Corsill Point, Portpatrick*—steam to Ireland, 21 miles off—*Mull of Galloway*, at which point we enter the *Solway Firth*, parts of which are *Luce Bay, Wigtown Bay*, and *Kirkcudbright Bay. Burrow Head* lies between Luce and Wigtown

Bays. The chief rivers entering the Solway are the *Dee*, the *Nith*, with its port of *Dumfries*, the *Annan*, and the *Eden* in Cumberland. Continuing south, along the English coast, we pass the coal ports of *Maryport*, *Whitehaven*, and *Workington*, round *St. Bee's Head*, reach *Barrow-in-Furness*, cross the mouth of *Morecambe Bay*, receiving the waters of the *Lune*, skirt the coast of Lancashire, on which stand *Fleetwood*, *Blackpool*, *Preston* at the mouth of the *Ribble*, and *Liverpool* and *Birkenhead* (in Cheshire), a combination-town forming the most wonderful example of seafaring enterprise in this or almost any country of the world. Crossing the *Estuary of the Dee*, we coast along Wales, past *Great Orme's Head*, through the *Menai Straits*, with *Bangor*, round the peninsula of *Braich-y-pwll* into *Cardigan Bay*, a long stretch, at the south end of which are *Strumble Head* and *St. David's Head*. The peninsula of Pembroke is cut by *St. Bride's Bay* and *Milford Haven*, leaving which we pass *St. Gowan's Point*, enter *Caermarthen Bay*, and beyond *Worms Head*, we reach our destination, the *Bristol Channel*.

2. What differences of climate are there between the East and the West Coasts of Great Britain? Give reasons for these differences.

The average fall of rain over Great Britain is much greater on the West than on the East coast, the average number of rainy days on the east being 165 and on the west 208. This great difference of climate between the east and west sides arises from the configuration of the land and the general prevalence of westerly winds, charged with vapour from the Atlantic. These winds, meeting with the cooler mountain ranges, lose their moisture and give rise to nearly all the principal rivers in the island. The barren hills on the West are almost continually shrouded in mist, while the districts beyond them receive only the proper amount of water.

3. Say what you know about the physical features and industrial pursuits of Cornwall, Durham, Ayrshire, and Galway.

If you can, draw a map to illustrate *one* answer, and insert the lines of latitude and longitude.

Cornwall has a rugged surface, an indifferent soil, and a scarcity of timber. Its climate is mild and healthy, but very moist. Its tin mines are the most celebrated in the world. The district richest in metals extends from Dartmoor in Devonshire to Land's End, but the most varied mineral wealth is confined to a little space in the southern end of the peninsula, to which place fully nine-tenths of the people have been drawn to follow the industries of tin and copper mining.

Durham consists of moorlands with lead mines in the Pennine Chain; a tract of coal-measures in the middle; and a belt of agricultural soil on the coast, in the southern part of which salt-mines are found. The three chief rivers rise close together in the W., and are the *Tyne* forming the N. boundary, the *Tees* the S., and the *Wear* running through its centre. The chief industries are coal and iron mining, the manufacture of glass, shipbuilding, salt-making, sail-cloth manufacture, and shipping.

Ayrshire lies on the Firth of Clyde, and is separated from the basin of that river by a low range of hills on the N.E., while on the S.E. it is bounded by the hills stretching from the Lowthers to the Solway. It is crescent-shaped, and watered by five main streams, rising in the eastern hills, the chief of which is the Ayr, dividing the county into two parts. In the south lies *Carrick*, very hilly, thinly peopled, and chiefly devoted to pasture-land; to the N., is *Cunningham*, pastoral and rich in coal-measures; and between these is *Kyle*, the richest and most populous of the three parts, forming one of the centres of Scotch manufacturing industry. Kyle and Cunningham are thickly crowded with towns and villages, whose outward trade is carried on through the ports of the Clyde. Ayrshire has been called the *dairy* of Scotland, and gives name to a breed of cattle.

Galway in general consists of an immense level plain, extending far inland, bounded by the *Suck*, the *Shannon*, and *L. Derg*. The smaller portion of the county is composed by a mass of heights, the *Connemara Mts.*, running towards the sea along the shores of Galway Bay, and almost cut off from the level tract by *Loughs Mask* and *Corrib*. This rocky district is barren and deserted, and the few small towns lie in the river valleys of the plain. The chief industry is farming; the cattle fairs of Balinasloe being the most important in Ireland.

Composition.

Write from dictation the passage given out by the Inspector.

Penmanship.

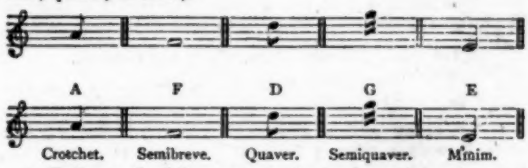
Write in large hand, as a specimen of copy-setting, the word, *Harpsichord*.

Write in small hand, as a specimen of copy-setting, *Poised in mid air upon the giddy mast.*

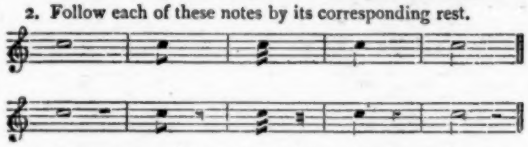
Music.

A quarter of an hour allowed for this Paper.

1. Write over each of the following notes its pitch name (D, D, *Do*, *Re*, or other), and under each its duration name (crotchet, quaver, or other).



2. Follow each of these notes by its corresponding rest.



3. Suppose we make one beat while we sing a crotchet, how many shall we make while we sing a minim?

If we make one beat while we sing a crotchet, we must make *two* beats while we sing a minim, because a minim is equal in duration to two crotchets.

FIRST YEAR.

Pupil Teachers at end of First Year.

Three hours and a-half allowed.

Arithmetic.

MALES.

1. Reduce 7 quarters 5 bushels 3 pecks 1 gallon 2 quarts to the decimal of a quarter.

4 | 2 qts.
2 | 1·5 gall.
4 | 3·75 pk.
8 | 5·9375 bush.
7·7421875 quarters. Ans.

2. If to one person a testator bequeaths $\frac{9}{20}$ of his property, to another $\frac{1}{3}$, and to another the remainder, viz., £300, what is the value of the whole property?

After $\frac{9}{20} + \frac{1}{3}$ are given away there remains $\frac{20 - (9 + 7)}{20}$ or $\frac{1}{10}$ of the whole, ∴ the whole $= \frac{£300 \times 10}{3}$ or £1,000.

3. If $\frac{3}{4}$ of a lb. cost $\frac{1}{2}$ of a shilling, what will $\frac{3}{4}$ of a cwt. cost?

$\frac{3}{4}$ cwt. $= \frac{3 \times 28}{4}$ lbs.
∴ $\frac{3}{4}$ lbs. : $\frac{3 \times 28}{4}$ lbs. :: $\frac{1}{2}$s. : cost required.
$\frac{1}{2}$s. $\times \frac{3 \times 28}{4} \times \frac{4}{3} = \frac{3 \times 28}{2 \times 3}$s. $=$ £2 1s. 9$\frac{1}{2}$d. Ans.

4. If an oz. of gold be worth £4·18953, what is the value of ·3753 lbs.?

(*a*) ·3753 lb. × 12 = 4·504 ozs. Troy.
(*b*) £4·18953 = val. of 1 oz.

4·504
1675813
209476666
1675813333
£18·80905813 = ,, 4·504 ozs.
20
17·3931626s.
12
4·7179512d.

∴ the Answer in £ s. d. = £18 17s. 4 7...d. 16

FEMALES.

1. A person after paying a poor rate of 10d. in the pound has £728 6s. 8d. remaining: what had he at first?

After paying 10d. in the £ he has 230d. left out of 240d.
∴ 230d. : 240d. :: £728⅔ : total required.
$£728\frac{2}{3} \times \frac{240}{230} = £760.$ Ans.

2. A garrison of 1,000 men, which was victualled for 60 days, was reinforced at the end of 18 days, and then the provisions were exhausted in 30 days: what was the number of men in the reinforcement?

When the reinforcement arrived there were provisions for 42 days.
∴ 30 days : 42 days :: 1,000 men : total in garrison.
1,000 men × $\frac{42}{30}$ = 1,400 men.
∴ Reinforcement = 1,400 − 1,000, or 400 men. Ans.

3. If the carriage of 15 tons 17 cwts. 1 qr. of goods for 257¾ mls. cost £16 6s. 7½d, what weight at the same rate will be carried 211½ mls. for £21 15s. 6d.?

£16 6s. 7½d. : £21 15s. 6d.
or or
7,839 halfd. : 10,452 hal'd. } :: 1,269 qrs. : weight reqd.
846 qrs. of ml. : 1,031 qrs. of ml.

$$\frac{1{,}269 \text{ qrs.} \times 10{,}452 \times 1.031}{7{,}839 \times 846} = 2{,}062 \text{ qrs.} = 25 \text{ tns. } 15 \text{ cwt. } 2 \text{ qrs.}$$

4. A wall that was to be raised 36 ft. high was raised 9 ft. in 6 days by 16 men: how many more men must be employed to finish it in 4 days?

9 ft. : 27 ft. (rem. of wall) } :: 16 : total men required.
4 days : 6 days }

$$\frac{16 \text{ men} \times 27 \times 6}{9 \times 4} = 72 \text{ men in all.}$$

∴ the extra number = 72 − 16, or 56 men. Ans

Grammar.

1. Parse all the pronouns in the following:—

'How happy is he born or taught,
That serveth not another's will,
Whose armour is his honest thought,
And simple truth his highest skill.'

he—pers. pron., 3rd pers. sing., mas., referring to (*man* indefinitely), nom., subj. of *is*.
that—simple rel. pron., referring to *he*, 3rd pers. sing., mas., nom., subj. of *serveth*.
another's—indef. pron., 3rd pers. sing., mas. (or fem.) p ss., attrib. to *will*.
whose—simple rel. referring to *he*, 3rd pers. sing., mas., poss., attrib. to *armour*.
his—poss. adj. pron., 3rd pers., limiting *thought*.
his— " " " *skill*.

2. In the following sentence show that a preposition makes an intransitive verb transitive:—

'Full well they laughed with counterfeited glee
At all his jokes; for many a joke had he.'

The verb *laughed*, which is generally intransitive, is rendered transitive by means of the preposition *at*. If it were said that '*they laughed*' the action is confined to the actors, but the phrase '*they laughed at*' requires an object to complete the meaning, which is supplied in '*all his jokes*.' To test if such combinations are true 'compound' or 'preposition-verbs,' as they are sometimes called, try if they make good sense in the passive form; as, '*His jokes were laughed at*.' This proves *at* to be virtually part of the verb *laugh*.

3. Give examples of adverbs of manner, time, and place.

The following are adverbs of
Manner—rapidly, well, so, thus, somehow, anywise.
Time—when, to-day, hereafter, lately, by-and-by.
Place—here, yonder, up, anywhere, where, homewards.

Adverbs of *time* may be classified into those denoting (1) When? (2) How long? (3) How often? and those of *place* into (1) Where? (2) Whither? (3) Whence?

Geography.

1. Draw a full map of Spain and Portugal. Insert the lines of latitude and longitude.

2. Trace minutely the course of the Loire, mentioning in order its tributaries and the towns in its basin, and describing the character of the country through which it flows.

The *Loire* rises in the Cevennes, flows with a winding course towards the north as far as Nevers, near which it is joined by the *Allier*, a tributary which, rising in the same chain of mts., flows parallel with the Loire, from which it is separated by a range of hills. From Nevers the Loire proceeds to the north-west until it reaches *Orleans*, where it bends to the west and continues in this direction till it falls into the Bay of Biscay. In this part of its course it receives the *Cher*, *Indre*, and *Vienne* of the left, and the united *Mayenne*, *Sarthe*, and *Loir* on the right These are its principal feeders, but the branches received by the Loire are very many, and this river constitutes the great outlet for the produce of central and western France. The banks are celebrated for their beauty, particularly in the neighbourhood on Tours. The chief towns in its basin are *Le Puy*, *St. Etienne*, *Nevers*, *Clermont*, *Moulins*, *Orleans*, *Tours*, *Limoges*, *Poictiers*, *Saumur*, *Alençon*, *Le Mans*, *Mayenne*, *Angers*, and *Nantes*.

History.

1. Make a list showing names and dates of our kings from 802 to 901.

			A.D.
Egbert	became	King of the West Saxons ...	802
"	"	" English kingdom	829
Ethelwulf	"	" "	837
Ethelbald	"	" "	858
Ethelbert	"	" "	860
Ethelred I.	"	" "	866
Alfred	"	" "	871
Edward the Elder		" "	901

2. Write out the succession of our sovereigns from Henry II. to Edward II., with dates.

		A.D.
Henry II.	began to reign ...	1154
Richard I.	" ...	1189
John	" ...	1199
Henry III.	" ...	1216
Edward I.	" ...	1272
Edward II.	" ...	1307, deposed 1327.

3. What sovereigns reigned in England during the eighteenth century? Give the dates of accession.

William III. was reigning at the beginning of eighteenth century, and the date of his accession was A.D. 1680

Anne	began to reign	1702
George I.	"	1714
George II	"	1727
George III.	"	1760

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Harpsichord*.

Write, in small hand, as a specimen of copy-setting, *Poised in mid air upon the giddy mast*.

Composition.

Write from memory the substance of the passage read to you by the Inspector.

Music.

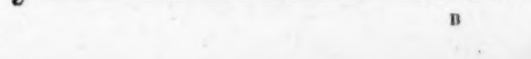
A quarter of an hour allowed for this Paper.

1. What is meant by a *sound*, what by a *tone*; and how does a sound differ from a tone?

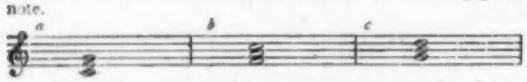
Sound is the effect on the ear of the vibration of the air caused by some disturbing force. When the vibration is regular the result is a *musical* sound.

A *tone* is the interval between two sounds, either higher or lower, and can be divided into two semitones. The natural scale has eight sounds, rising in successive steps by tones and semitones, the latter being found between the third and fourth, and seventh and eighth sounds.

2. What is a *triad*? Write in *a*, *b*, and *c* severally the triads of (C) Do, (F) Fa, and (G) Sol.



A *triad* is the addition of its third and fifth to any given note.



3. How many tones and how many semitones are found in a diatonic scale, and what are the places in it of the latter?

In a diatonic scale are found five tones and two semitones, the latter being found between the third and fourth, and seventh and eighth notes.

SECOND YEAR.

Pupil Teachers at end of Second Year.

Three hours and a half allowed.

Arithmetic.

MALES.

1. At what rate per cent. per annum will £79 amount to £100 in 7½ years? Give your answer in £ s. d.

Interest in 7½ years = £100 − 79 = £21.

" 1

∴ 7½ yrs. : 1 yr. } :: £21 : rate p. c.
£79 : £100 }

$$\frac{£21 \times 2 \times 100}{15 \times 79} = \frac{£280}{79} = £3\ 10s\ 10\tfrac{2}{79}d.$$ Ans.

2. A warehouse contains goods worth £17,230, and is insured only for 86·3 per cent. of its value; what sum would be lost in case of its destruction by fire?

Since $\frac{86·3}{100}$ is covered by insurance, then $\frac{13·7}{100}$ will be lost in case of its destruction, *i.e.*,

$\frac{13·7}{100}$ of £17,230 = £172·3 × 13·7

172·3
13·7
12061
5169
1723
£2360·51 = £2360 10s. 2·4d. Ans.

3. An agent who is paid 2½ per cent. on all money he collects receives £57 as commission; how much has he collected?

£2½ is got from £100
1 " " $\frac{100}{2\frac{1}{2}}$
∴ £57 " " $\frac{400 \times 57}{11}$

i.e., $£\frac{22800}{11}$ or £2072 14s. $6\frac{8}{11}$d. Ans.

4. In what time will a sum of money double itself at 3½ per cent. per annum simple interest?

In other words, '*In what time will £100 gain £100 at 3½ p. c. per annum?*'

£100 brings £3½ in 1 yr.
£100 " £1 " $\frac{2}{7}$ "
∴ £100 " £100 " $\frac{200}{7}$ yrs., or 28½ yrs. Ans.

FEMALES.

1. Compare the values of:—
(*a*) ⅔, 1⅓, ⅓ of ⅔, 1, and ⅓ of ⅓ of $1\frac{1}{10}$; and simplify
(*b*) $\frac{84}{280} + \frac{36}{70} + \frac{70}{280} + \frac{20}{280}$

(*a*) simpler = ⅔, 1⅓, 2/9, 1, and $\frac{11}{270}$
or $\frac{180}{270}$, $1\frac{90}{270}$, $\frac{60}{270}$, 1, and $\frac{11}{270}$

Hence, according to value
(1) 1⅓, (2) 1, (3) ⅔, (4) ⅓ of ⅔, (5) ⅓ of ⅓ of $1\frac{1}{10}$.

(*b*) $\frac{84 + 36 + 70 + 20}{280} = \frac{210}{280} = \frac{3}{4}$. Ans.

Note—$\frac{9}{12} = \frac{3}{4}$.

2. A man gave 15 tons of coals among the poor, giving each 1⅔ cwts.; among how many persons did he divide it?

No. of persons = 15 tons, *i.e.*, 300 cwts. ÷ 1⅔ cwts. = $\frac{300}{\frac{5}{3}}$ = 180. Ans.

3. Oats are worth ⅘ of 7s. 6d. a bus., and hay £3 10s. a ton; how many bushels of oats ought to be given for 2½ tons of hay?

$$\frac{£3\frac{1}{2} \times 2\frac{1}{2}}{\frac{4}{5} \text{ of } 7\frac{1}{2}s.} = \frac{£\frac{35}{4}}{\frac{4}{5} \text{ of } \frac{15}{2}s.} = 175s. \div \tfrac{6}{10}s.$$
$$= \frac{175 \times 10}{6} = \frac{350}{3} = 37\tfrac{1}{3} \text{ bus.}$$ Ans.

4. What is the value of $\frac{7}{331}$ of 1 ton 77 lbs.?

$$\tfrac{7}{331} \text{ of } 1 \text{ ton } 77 \text{ lbs.} = \frac{2317 \text{ lbs.} \times 7}{331}$$
$$= 7 \times 7 = 49 \text{ lbs.}$$
i.e., 4 cwts. 3 qr. 14 lbs. Ans.

5. If 1½ bus. of wheat will sow 1½ ac., what will the wheat cost for 37 ac. at £3 4s. a quarter?

Price of wheat per bus. = ⅘s. = 8s. ∴ 1½ bus. cost 10⅔s.

Hence 10⅔s. × $\frac{37 \text{ ac.}}{1\frac{1}{2} \text{ ac.}}$ = $\frac{32}{3}s. \times \frac{74}{3} = \frac{2368}{9}s.$ = £13 3s. 1⅓d.

Grammar.

'Only a sweet and virtuous soul
Like seasoned timber never gives;
But, though the whole world turn to coal,
Then chiefly lives.'

1. Point out the two co-ordinate sentences in the above, and analyse fully the subordinate sentence.

1st sentence:—'Only a sweet and virtuous soul
Like seasoned timber never gives.'
2nd sentence:—'But, though the whole world turn to coal,
Then (*it*) chiefly lives.'

Analysis of Subordinate Sentence (of concession).

'Though'	...	...	*Connective (subordinate).*
'world'	...	...	*Simple subject.*
'the whole'	...	...	*Enlargement of subject.*
'turn'	...	...	*Incomplete predicate.*
'to coal'	...	...	*Complement of predicate.*

2. Point out the conjunction in the above that joins the two co-ordinate sentences, and say to which class it belongs.

'*But*' is the co-ordinating conjunction, and as it contrasts the second sentence with the first, it belongs to the *adversative* class of co-ordinating conjunctions.

3. What are subordinate conjunctions? Give examples.

Subordinate conjunctions are those which connect sentences of which one *enters into the construction of the other sentence with the force of an adverb or a noun.*

Simple	subordinate conj.	:—that
Temporal	"	" :—now, since, after.
Causal	"	" :—because, for, lest.
Conditional	"	" :—if, except, whether.
Concessive	"	" :—though, although.
Alternative	"	" :—whether—or.

Geography.

1. Draw a full map of Australia.

Insert the lines of latitude and longitude; and explain how they are useful in drawing a map.

The lines of latitude and longitude are useful in fixing the positions of places exactly as they are on the earth itself. They form, in fact, a complete set of guiding lines for drawing a correct representation of parts of the earth.

2. Give notes of a lesson on the climate and productions of British North America.

(1) CLIMATE.—In Canada the climate is *excessive*—the heat of summer and the cold of winter being much greater than in corresponding latitudes in Europe—dryness of the air and absence of high winds greatly moderate the severity of winter, and render the climate salubrious and conducive to lengthen human life; dangerous epidemics are almost unknown, people troubled with affection of the lungs enjoy better health than in Britain; sky pure, and fogs seldom seen; winter begins in Lower Canada in November and ends in April; in Upper Province it is shorter; on borders of Great Lakes winter is milder than in the interior; the St. Lawrence is generally frozen for five months in the year.

In British Columbia, embracing all British America west of the Rocky Mountains, the climate is very moist in summer and extremely cold in winter; in elevated interior snow blocks up the mountain passes from October to July.

In Hudson's Bay, or North-West Territory at Fort York, the winter cold is intense, the thermometer descending so low as 50° below zero, brandy freezing into a solid substance, in rooms with a constant fire.

Newfoundland Coast much subject to fogs, no doubt from the condensation of the vapour from the warmer sea.

(2) PRODUCTIONS.—*Animals*—Fur-bearing, such as bear, wolf, fox, lynx, etc. Carriboa-deer in vast herds in Newfoundland, to which island the Newfoundland dog is peculiar. Two remarkable features in Canadian bird-life:—1, Birds are all destitute of song; 2, The stated migration of birds in immense crowds to and from the Arctic regions. Domestic animals comprise horses, sheep, swine, and poultry; seas, bays, and rivers swarm with fish; 'bank of Newfoundland' long celebrated for its cod. Game of all kinds abound in the whole territory.

Minerals.—All the known useful minerals are found in this vast region. Gold in British Columbia and Nova Scotia; copper in Lake Huron and Lake Superior very valuable; maritime provinces of Canada comprise inexhaustible supplies of coal and ironstone, building and other stone of all descriptions.

Vegetables.—Wheat of the finest quality grown in the greatest abundance, apples and cider exported, sugar from maple tree, all the home fruits, etc., grown in Canada. Great forests of timber produce "lumber," which is the source of great wealth, especially in New Brunswick. Hemp and flax are indigenous to the soil, and can be grown profitably in many parts. Agriculture is now taking the place of the original timber trade, which, however, still forms the most valuable branch of commerce.

SECOND PAPER.

One hour allowed for Females.
Two hours and a half allowed for Males.

History.

1. What British prince early in the sixth century checked the extension of Wessex? Give place and date of a battle won by him.

In 495 a body of Saxons, under Cerdic and his son, founded the Kingdom of Wessex; but in 520 the British prince, Arthur, defeated the Saxons at Badbury, in Dorsetshire, and checked for a whole generation their advance westwards.

2. How came Richard I. to be taken captive by the Duke of Austria? Narrate the circumstances.

Richard I., in his hurry to get home from the Crusades, had left his fleet and gone on as a private traveller. Having been wrecked on the coast of the Adriatic, he made his way in disguise into Austria, where he was seized by Leopold, Duke of that country, who had been insulted by Richard during the Crusade. The Duke sold him to the Emperor, Henry VI., who did not release him till such a heavy ransom was paid that every Englishman had to give a fourth of his goods.

3. Mention names and dates of the most famous battles between English and French from Edward III. to Henry VI.

Battle of Crecy, fought 1346, gained by Edward III.
" Poictiers " 1356 " Black Prince.
" Agincourt " 1415 " Henry V.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Harpsichord.*

Write, in small hand, as a specimen of copy-setting, *Poised in mid air upon the giddy mast.*

Composition.

Write full notes of a lesson on *simple geometrical forms.*

Notes of a lesson on '*Simple geometrical forms.*'

I.—Class provided with slates and pencil, and seated in front of blackboard—two points made—ask pupils to join them with the shortest line possible—this called a *straight* or *right* line—join points with other lines not straight but *curved*—two straight lines drawn side by side, neither approaching nor receding from each other—these *parallel* straight lines—two lines drawn to form a corner, such *corner* called an *angle*—one line standing upright on another, said to be at *right* angles—a ruler may be made to do duty as a moving line to show the formation of angles as *acute* or *obtuse.*

II.—Ask for a figure made with three lines—compare this with the *triangle* of a musical band—question on number of sides and angles—sides may be all of same length—two may be equal—or all unequal—give names *equilateral, isosceles*—angles may be all equal, &c. After exhausting triangles, proceed to four-sided figures—ask for objects having four lines bounding them—show figures with opposite sides parallel—explain parallelogram—*square* with four sides equal, and angles, right angles—show *oblong* or *rectangle*—and so proceed to other four-sided figures, asking for examples of each at every step.

III.—Make a point on board, and place many points equally distant from it round it—ask for objects of a similar shape, as wheels, coins, &c.—question on position of the first with respect to the others—and give the names *circle* and *centre*—draw lines from the centre to the points in the *circumference* (which explain)—the lines resembling *spokes* of a wheel—or *rays*—*radii* (explain)—and finish lesson with *diameter, semicircle, arc, chord,* &c.

NOTE.—During the lesson the pupils should follow on slates the work of the teacher on the blackboard, and each new word should be printed clearly, and the class practised in the pronunciation of these terms.

Euclid.

[All generally understood abbreviations for *words* may be used.]

1. Name the different parts of which every proposition consists. What is the distinction between a *direct* and an *indirect* demonstration?

Every proposition, when complete, may be divided into six parts:—

(1) *The proposition* or *general enunciation*, stating in general terms the conditions of the problem or theorem.
(2) *The exposition*, or *particular enunciation*, which exhibits the *subject* of the proposition in particular terms as a fact referring to some diagram described.
(3) *The determination* contains the *predicate* in *particular* terms as it is pointed out in the diagram, and directs attention to the demonstration, by pronouncing the thing sought.
(4) *The construction* applies the postulates to prepare the diagram for the demonstration.
(5) *The demonstration* shows the possibility or impossibility of the problem, and the truth or falsehood of the theorem in the particular case exhibited by the diagram.
(6) *The conclusion* is merely the repetition of the general enunciation wherein the predicate is asserted as a demonstrated truth.

A *demonstration* is said to be *direct* when the predicate is inferred directly from the premisses, as the conclusion of a series of successive deductions. When a result is established by showing that some absurdity follows from supposing the required result to be untrue, the demonstration is called *indirect.*

2. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise their bases equal: the angle which is contained by the two sides of the one shall be equal to the angle contained by the two sides equal to them of the other.

See Prop. VIII. Bk. I.

3. If one side of a triangle be produced, the exterior angle is greater than either of the interior opposite angles.

See Prop. XVI. Bk. I.

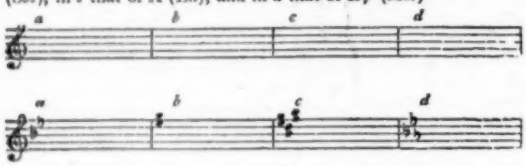
Music.

A quarter of an hour allowed for this Paper.

1. Write, under each of the following intervals, its name (second, third, or other) and quality (major, perfect, or other).

2. Place before *a* and *b* their time signatures.

3. Write in *a* the scale signature of B♭ (*Si*), in *b* that of G (*Sol*), in *c* that of A (*La*), and in *d* that of E♭ (*Me.*)



THIRD YEAR.

Pupil Teachers at end of Third Year, *if apprenticed on, or after, 1st May,* 1878; **and Pupil Teachers at end of Fourth Year,** *if apprenticed before that date.*

Three hours and a half allowed.

Arithmetic.

MALES.

1. By selling 26 yards at 3s. 4½d. per yard a draper gains 6s. 6d. What was the prime cost per yard, and what is the gain per cent.?

(*a*) 26 yds. gain 6s. 6d. ∴ 1 yd. gain $\frac{7}{4}$d. or 3d.
∴ prime cost per yd. = 3s. 4½d. − 3d. or 3s. 1½d.

(*b*) 3s. 1½d. gains 3d. or $\frac{3}{7}$ = $\frac{3}{175}$ of whole.
∴ gain per cent. = $\frac{3}{175}$ of 100, or 8. Ans.

2. What amount of capital is that which after having been employed at 5½ per cent. simple interest for four years, becomes £5,000?

Amount of £100 for 4 yrs. at 5½ p. c. = £122.
∴ £122 : £5,000 :: £100 : principal required.

$$\frac{£100 \times 5000}{122} = \frac{250,000}{61} = £4,098\ 7s.\ 2\tfrac{2}{61}d.\ \text{Ans.}$$

3. What sum invested in the 3 per cents. at 98¼ will purchase £7,268 worth of stock?

£100 of stock will be purchased by £$\frac{98\frac{1}{4}}{100}$
1 „ „ £$\frac{98\frac{1}{4}}{100}$
∴ £7,268 „ „ £$\frac{7,268 \times 98\frac{1}{4}}{100}$
i. e. £7,140·81
i. e. £7,140 16s. 2·4d. Ans.

4. What is the exact present value of a debt of £572 due eight months hence at 3·75 per cent. simple interest?

Int. of £100 for 8 mo. at 3·75 p.c. per ann. = £3·75 × $\frac{8}{12}$ = £2·5
Amount „ „ „ = £102·5
∴ £102·5 : £100 :: £572 : exact pres. val.

$$\frac{£572 \times 200}{205} = \frac{572 \times 40}{41} = \frac{22,880}{41} =$$
£558 os. 11$\frac{3}{41}$d. Ans.

FEMALES.

1. Divide 172·9 by ·142 to three decimal places.

$$\frac{172·9}{·142} = \frac{172900}{142} = 1217·605\ldots\ \text{Ans.}$$

2. Convert $\frac{3}{8} + 3\frac{1}{8} + 2\frac{5}{10} + 6\frac{11}{125}$ into a decimal.

$\frac{3}{8}$ = $\frac{375}{1000}$
$3\frac{1}{8}$ = $3\frac{125}{1000}$
$2\frac{5}{10}$ = $2\frac{500}{1000}$
$6\frac{11}{125}$ = $6\frac{88}{1000}$
$11\frac{1088}{1000} = 12\frac{88}{1000} = 12·038$. Ans.

3. Express the difference between ¾ pk. and ·0625 of a bushel as the decimal of a quarter.

(*a*) ¾ pk. = ·75 pk. = ·1875 bush.
∴ ·1875 bush − ·0625 bush. = ·125 bush.
(*b*) ·125 bush. ÷ 8 = ·015625 qr. Ans.

4. Divide 50 into two parts, such that one shall exceed the other by 6·75.

$$\text{Greater} = \frac{50 + 6·75}{2} = \frac{56·75}{2} = 28·375$$
$$\text{Less} = \frac{50 - 6·75}{2} = \frac{43·25}{2} = 21·625.\ \text{Ans.}$$

Grammar.

'O, my *Lord*,
Press not a falling man too far; 'tis virtue:
His faults lie open to the laws; *let* them,
Not you, *correct* him. My heart weeps to see him
So little of his great self.'—SHAKSPERE.

1. Analyse the above passage as far as 'correct him'; and parse the words in italics.

Sentence	Kind of Sentence.	Subject.	Predicate.	Object.	Extension.
(*a*) O, my Lord, press not a falling man too far	principal	(*thou*) my lord	press not	a falling man	too far (*deg.*)
(*b*) 'Tis virtue	Subord of reason to (*a*)	it	is virtue		
(*c*) His faults lie open to the laws;	principal	His faults	lie		open to the laws (manner)
(*d*) Let them correct him.	prin. in illative co-ord. with (*c*)	(*thou*)	let	them (dir) correct him (indirect)	
(*e*) (*Let*) not you (*correct him*)	prin. same as (*d*)	(*thou*)	(*let*) not	you (direct) (*correct him*) (indirect)	

Parsing.

Lord—noun proper, mas., sing., vocative case, or nom. of address.
let—trans. verb., irreg. *let, let, let,* imper. 2nd pers. sing. agreeing with (thou) or plur. with (you).
correct—trans. reg. verb, pres. infinitive gov. by *let.*
so—adv. of degree mod. *little.*
little—adj. predicative of *him.*
of—prep. gov. obj. case *self.*
his—poss. adj. limiting *self.*
great—adj. qualifying *self.*
self—noun neut. sing. obj. by *of.*

2. Give the full meaning of the passage:—

My Lord be not too harsh with a man who is on the road to ruin, for gentleness towards him would be a virtue. Let the wrong that he has done be judged by the laws, for they should deal out his punishment, and not you. I am grieved to see that he has lost so much of his former greatness, both of place and of principle.

3. Give examples of the various ways in which the subject of a sentence may be extended.

The subject may be enlarged by—

1. One or more adjectives :—*This old, red* book is mine.
2. Words in apposition :—Garfield, *the President,* was assassinated.
3. Participles or participial phrases :—He, *having failed,* left the town.
4. A prepositional phrase :—The fear *of man* is a snare.
5. A noun or pronoun in the possessive case :—*Harry's* uncle has come.
6. The gerundial infinitive :—Bread *to eat* was scarcely to be got.

Geography.

1.—Draw a full map of Australia. Insert the lines of latitude and longitude, and explain why they are useful in drawing a map.

The lines of latitude and longitude are useful in fixing the positions of places exactly as they are on the earth itself. They form, in fact, a complete set of guiding lines for drawing a correct representation of parts of the earth.

2. Give notes of a lesson on 'The Isthmus of Suez and the Red Sea.'

Notes of a lesson on 'The Isthmus of Suez and the Red Sea.'

I. *Where located.*—The isthmus forms the connection between Asia and Africa; Red Sea lies between them; the isthmus separates the Red Sea from the Mediterranean, while the Red Sea, by means of the Suez Canal, connects the waters of the Mediterranean with those of the Arabian Sea.

II. (*a*) *Description of Isthmus.*—Seventy-two miles broad; surface generally sandstone, which has in many places been ground to sand; not level, but having many depressions occupied by salt marshes or lakes, the most notable being Abu Ballah Lake, Lake Temsah, and the Bitter Lakes; it is almost entirely destitute of drinkable water; ancient canal used to connect the waters of the Nile with the Red Sea. The well-known *Suez Canal,* constructed by M. de Lesseps, is just 100 miles long; large artificial harbour at upper end, of 500 acres. At Port Said, from which town canal passes through Lake Menzaleh, a shallow swamp, then through Kantara cutting three miles, through Ballah Lake, through a portion of a plateau eight miles long, through Lake Temsah, where stands the flourishing town of *Ismailia,* through nine miles of dry land, through the Bitter Lakes, through a further portion of seventeen miles of land and dried-up lakes, where it reaches *Suez,* where all the necessary piers, docks, etc., have been constructed. And we now have a

III. *Description of the Red Sea.*—A branch of the Indian Ocean, connected with it by Straits of Babelmandeb, from which to the Isthmus of Suez it is 1,400 miles; breadth is nowhere more than 230 miles; at north end are two branches called Gulfs of Suez and Akaba, separated by the Peninsula of Sinai.

Character.—Very deep, in some places 230 fathoms; navigation difficult on account of numerous reefs and sandbanks; subject to sudden changes of wind, and S.E. monsoon blows for eight months, and the N.W. during the remainder of the year; said to be named on account of *red animalculæ* found at certain seasons in the many coral reefs which run parallel to the shore.

History and use.—First mentioned in connection with the Israelites; in time of Solomon the advantages of its navigation seem to have been well understood; discovery of passage to India nearly destroyed for a time the commerce and navigation of the Red Sea, but by the construction of the fore-mentioned canal English steam packets are now constantly passing and repassing. By the purchase of the Khedive's shares in the Suez Canal the British Government secured in great measure a short water-way to their Indian dominions.

SECOND PAPER.

History.

One hour allowed for Females.
Two hours and a half allowed for Males

1. What is meant by the Restoration of the Stuarts. How was it brought about?

By the Restoration of the Stuarts is meant the abolition of the government of the Commonwealth and the return to a Monarchy by the recall of Charles II. to the throne of England, 1660.

It was brought about in the following way, The military government which the officers under General John Lambert had set up in London not only dissatisfied Monk, the Commander of the English army in Scotland, but the fleet, the people, and even the soldiers. Fairfax, co-operating with Monk, mustered his friends, and so far were things successful that Monk on his return to London declared for a free Parliament, an announcement that was received with the greatest joy. The members 'purged' by Pride took their seats, and Parliament, after issuing writs for a general election, decreed its own dissolution. The new Parliament, called a *Convention,* met 25th April, 1660. Monk had been keeping Charles well informed of all that was going on, and the latter issued a Declaration from *Breda.* Eight days after the issue of this Declaration, *Charles II.* was proclaimed King, and on May 29, amid the greatest enthusiasm, he returned to London, which event has been styled the *Restoration of the Monarchy*

2. When and how did England win Canada?

During the Seven Years' War, in September, 1759, *James Wolfe,* a young general of Pitt's choosing, having scaled the almost inaccessible heights on which *Quebec* stands, surprised the French under *Montcalm,* and completely defeated them. Both generals were killed, Wolfe falling in the moment of victory. Five days after, Quebec capitulated, and as this fortress was the key to Canada, within a year the colony was in the hands of the British.

3. Who reigned immediately before our Queen? What famous Acts of Parliament passed in that reign in reference to Reform and to Slavery?

William IV. reigned immediately before our Queen. During his reign a Reform Bill was passed, June 7, 1832, by which fifty-six boroughs were disfranchised, and forty-three new ones, together with thirty county constituencies, were created. A £10 householder got the right of voting in boroughs, and the right in counties was extended from forty-shilling freeholders to copyholders, leaseholders, and tenants of premises of certain values.

In August, 1833, an Act for the Abolition of Slavery was passed, by which twenty millions sterling were to be paid by this country in compensation to slaveholders in the British Dominions for setting free their slaves.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Harpsichord.*

Write, in small hand, as a specimen of copy-setting, *Poised in mid air upon the giddy mast.*

Composition.

Write from memory the substance of the passage read to you by the Inspector.

Euclid.

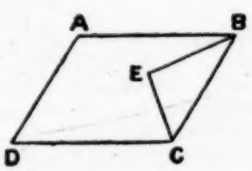
[All generally understood abbreviations for *words* may be used.]

1. If a straight line fall upon two parallel straight lines, it makes the alternate angles equal to one another; and the exterior angle equal to the interior and opposite upon the same side; and likewise the two interior angles upon the same side together equal to two right angles.

See Prop. XXIX., Bk. I.

2. Straight lines bisecting two adjacent angles of a parallelogram are at right angles to one another.

Let ABC, BCD two adjacent angles of the parallelogram ABCD, be bisected respectively by the straight lines BE, CE.



By I. 28 the angles ABC, BCD are together equal to two right angles, and therefore EBC, ECB being less than two right angles, EB, EC will meet. Let them meet in E; then EBC, ECB are together equal to one right angle, and since the three angles of every triangle are together equal to two right angles, (I. 32) therefore the remaining angle BEC must be a right angle. Q. E. D.

3. Triangles upon equal bases and between the same parallels are equal to one another.

See Prop. XXXVIII. Bk. I.

Algebra.

1. Prove the rule for finding the least common multiple of two expressions. Find it for x^2-3x+2, x^2-5x+6, and x^2-4x+3

(*a*) Rule to find the L. C. M. of two expressions :—*Divide the product of two expressions by their G. C. M.* Proof:—Let A and B denote the two expressions, and D their greatest common measure. Suppose $A=aD$ and $B=bD$. Then from the nature of the greatest common measure a and b have no common factor, and therefore their least common multiple is ab. Hence the expression of lowest dimensions which is divisible by aD, and bD is abD.

And $abD=Ab=Ba=\frac{AB}{D}$. Hence the rule given above; otherwise, *Divide either expression by the G. C. M., and multiply the other by it.*

(*b*) (1) $x^2-3x+2=(x-2)(x-1)$
(2) $x^2-5x+6=(x-2)(x-3)$
(3) $x^2-4x+3=(x-1)(x-3)$
$\therefore$ the L. C. M. $=(x-2)(x-3)(x-1)$
$=(x^2-3x+2)(x-1)$
$=\underline{x^3-4x^2-x-2}$.

2. Solve the equations :—

(1) $\frac{b^2}{x}+c=\frac{a^2}{c}$

(2) $\frac{1}{x-1}-\frac{2}{x+7}=\frac{1}{7(x-1)}$

(1) Clearing of fractions $b^2c+c^2x=a^2x$
$c^2x-a^2x=-b^2c$
$x=\underline{\frac{b^2c}{a^2-c^2}}$.

(2) Multiply each side by $7(x-1)(x+7)$.
$7x+49-14x+14=x+7$
$7x-14x-x=7-49-14$
$8x=56$
$x=\underline{7}$.

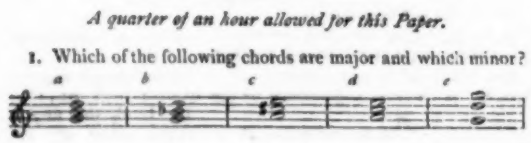
3. A and B have two guineas between them, and if A give to B one shilling for ever penny B has, A will then have ten shillings less than B; how much had each at first?

Let x = B's money in shillings
then $12x$ = ,, ,, pence
and $42-x$ = A's ,, ,, shillings
then according to terms of problem
$(42-x)-12x=(12x+x)-10$
$42-13x=13x-10$
$26x=52$
$x=\underline{2}$s. B's money and $\therefore \underline{40}$s. A's.

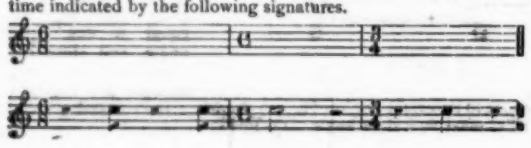
Music.

A quarter of an hour allowed for this Paper.

1. Which of the following chords are major and which minor?



2. Write a measure, of notes and rests, in each of the kinds of time indicated by the following signatures.



3. Write over each of the following the name of the major scale, and under each that of the minor scale, of which it is the signature.

FOURTH YEAR.

Pupil Teachers at end of Fourth Year, *if apprenticed on, or after,* 1st *May,* 1878; **and Pupil Teachers at end of Fifth Year,** *if apprenticed before that date.*

Two hours and a-half allowed.

Arithmetic.

MALES.

1. What capital sum laid out at $5\frac{1}{2}$ per cent. per annum simple interest, on the 1st of January, would amount to £1250 on the 29th of September in the same year, both days being included?
No. of days from Jan. 1st till 29th Sept.
$=(31+28+31+30+31+30+31+31+29)=272$
Interest of £100 for 272 days @ $5\frac{1}{2}$ p. c. per annum
$=£\frac{1\,4\,9\,6}{3\,6\,5}=4\frac{3\,6}{3\,6\,5}$
amount of do., for do. $=£104\frac{3\,6}{3\,6\,5}$
$\therefore £104\frac{3\,6}{3\,6\,5} : £100 :: £1250$: principal required
$\frac{1250\times 36500}{37996}=£\frac{11406250}{9499}=\underline{£1200\ 15\text{s.}\ 8\frac{3\,1\,1\,8}{3\,6\,1\,0}\text{d.}}$ Ans.

2. What is meant by 'insurance'?
What is the insurance on £7285 at £2 7s. 6d. per cent.? And if the rate of insurance be £1 6s. 4d. per cent., for what sum is an individual insured who pays an annual premium of £29 10s.?
(*a*) Insurance is a contract by which one party on being paid a certain sum or *premium* by another party on property which is subject to risk, undertakes, in case of loss to make good to the owner the value of the property. The premium is usually charged at so much per cent.

(*b*) £100 : £7285 :: £2½ : amt. required
$\frac{19\times 7285}{8\times 100}=£\frac{1384\cdot 15}{8}=\underline{£173\ 0\text{s.}\ 4\frac{1}{2}\text{d.}}$ Ans.

(*c*) 26s. 4d. : £29 10s. :: £100 : sum insured.
$£\frac{100\times 7080}{316}=£\frac{177000}{79}=\underline{£2240\ 10\text{s.}\ 1\frac{1}{4}\frac{1}{9}\text{d.}}$ Ans.

3. If I lay out £1270 in the 3 per cents. at $92\frac{1}{2}$, and sell out after allowing the dividends to accumulate for 2 years, and then find myself the richer by £147 10s., at what price do I sell out? Give your answer in decimals to four places.

Total increase of capital $=£147\frac{1}{2}=£147\frac{9}{1\,8}$
Two years' dividends $\left(\frac{1270\times 3}{92\frac{1}{2}}\right)\times 2=£3\frac{9}{1\,8}=82\frac{1}{2}=82\frac{9}{1\,8}$
Difference of capital to be made by sale $65\frac{9}{1\,8}$
$\therefore £1270 : £(1270+65\frac{9}{1\,8}) :: £92\frac{1}{2}$: selling price required
$\frac{£92\cdot 5\times 1335\frac{9}{1\,8}}{1270}=£\frac{18\cdot 5\times 98799}{254\times 74}=\frac{\cdot 5\times 98799}{254\times 2}=$
$£\frac{49399\cdot 5}{508}=\underline{£97\cdot 2431+}$ Ans.

A bankrupt's stock was sold for £520 10s. at a loss of 17 per cent. on the cost price. Had it been sold in the ordinary course of trade it would have realized a profit of 20 per cent.; for how much money below the trade price was it sold?

(*a*) 83 : 100 :: £520·5 : $\frac{520\cdot 5\times 100}{83}$ cost price.

(*b*) $\therefore$ 100 : 120 :: £$\frac{52050}{83}$: trade price.

$£\frac{52050\times 120}{83\times 100}=£\frac{62460}{83}=£752\ 10\text{s.}\ 7\frac{1}{2\,3}\text{d.}$

or briefly

	£	s.	d.	
83 : 120 :: £520·5 :	752	10	$7\frac{1}{2\,3}$	trade price.
subtract price of stock =	520	10	0	
$\therefore$ the amnt. below trade price =	232	0	$7\frac{1}{2\,3}$	Ans.

FEMALES.

1. What sum of money put out at 10 per cent. will produce £12 10s. for interest in 10 days?

£10 : £12·5 } :: £100 : Sum required.
10 days : 365 days }

$$\frac{£100 \times 12·5 \times 365}{10 \times 10} = £365 \times 12\tfrac{1}{2} = £4562\ 10s.\ \text{Ans.}$$

2. Simplify $3\frac{3}{4} + 1\frac{1}{2} + 13\frac{7}{10} + \frac{1}{20}$

$3\frac{3}{4} = 3\frac{1}{4} = 3\frac{5}{10}$
$1\frac{1}{2} = 1\frac{4}{10}$
$13\frac{7}{10} = 13\frac{7}{10}$
$\frac{1}{20} = \frac{1}{20}$
Sum $= 17\frac{17}{20} = 19\frac{1}{10}$. Ans.

3. A man collecting rents at a commission of $4\frac{3}{4}$ per cent. paid, after deducting his commission, £1482 3s. 9d. What amount of rent did he collect?

After deducting commission there remains $\frac{95\frac{1}{4}}{100} = \frac{765}{800} = \frac{153}{160}$

∴ Amount of rent collected = £1482 3s. 9d. $\times \frac{160}{153} =$

$$= \frac{£237150}{153}$$

i.e. £1550. Ans.

4. A woman bought a certain number of eggs at the rate of 4 for 3d., and sold them at the rate of 5 for 4d., by which she made a profit of 2s. How many eggs did she buy?

(*a*) Selling price of each = $\frac{4}{5}$d.
Buying ,, ,, = $\frac{3}{4}$d.
∴ the gain on each $= \frac{16-15}{20}$d. = $\frac{1}{20}$d.

(*b*) $\frac{1}{20}$d. is gained by sale of 1 egg
∴ 1d. ,, ,, 20 eggs
and 24 ,, ,, 480 eggs. Ans.

Grammar.

'Tell me not in mournful numbers,
Life is but an empty dream!
For the soul is dead that slumbers,
And things are not what they seem.'

1. How many kinds of sentences are there in the above? Point them out, and analyse fully the noun sentence.

The sentences in the above are as follows:—

(1) Tell me not in mournful numbers (*Principal*)
(2) Life is but an empty dream (*noun sent. subord. to* (1))
(3) For the soul is dead (Prin. sent. caus. to (1) and (2))
(4) That slumbers (adj. sent. subord. to (3))
(5) And things are not (*the things*) (Prin. cop. with (3) and caus. to (1) and (2))
(6) What they seem (adj. sent. subord. to (5)).

Analysis of Noun Sentence.

(*that*)	*Connective.*
Life...	*Simple subject.*
is	*Incomplete predicate.*
but an empty dream ...	*Completion of predicate.*

2. Comment on *what* and *but* in the above passage.

What in the above is a relative with its antecedent understood. It is generally called a *compound relative*, although the word is not compound. Perhaps the better way is to consider it as a simple relative with its antecedent understood. It is used as an adjective, as '*What* kind is it?' and as an interrogative, as '*What* do you say?'

But in such connections as the above is usually considered as an adverb, meaning 'only.' This construction is said to have arisen from the improper omission of a negative. The sentence in full would be 'Life is not a dream, but being, *i.e.*, except being an empty dream.'

But is also an adversative conjunction, as 'John reads, *but* James plays,' a relative 'There is no one *but* (= who not) loves to be praised' and a preposition, as 'They all fled but him.'

3. What are the proper prepositions to use after *difference, agree, averse, compared.*

With *difference* is used *between, e.g.* Find the difference between these two numbers.
With *agree* are used *with*, and *to, e.g.* I *agree with* you (person). *I agree to* your proposals.
With *averse* is used *to, e.g.* I am averse to that proceeding.
With *compared* are used *to*, and *with, e.g.* He *compared* anger *to* a fire. He *compared* this picture *with* that.

4. Show in what respects our language affords evidence of the different races which have inhabited this country.

Our language affords evidences of the different races whic have inhabited this country from the traces of their language found in every-day words, but especially in the *names of places*: For example we have traces

Of the *Celts* in *Kent, Avon, Ouse, Dee, Derwent, Pen-y-gant, etc.*
Of the Romans in *Stratford, Lincoln, Chester, Doncaster, Tadcaster.*
Of the Danes in *Grimsby, Scawfell, Stockgill Force, Langholm, Wansbeck.*

French had a greater hold on the upper classes; and in Law Courts to this day, the royal assent to Bills is announced in Parliament in the French words *Le Roi*, or *La reine le veut.* The *O Yes* of the Crier is a relic of the French *ouies!* hear!

Geography.

1. Give notes of a lesson to an advanced class on 'The lines of latitude and longitude, as shown on a globe, their meaning and their usefulness.'

Draw a map of South America, with the lines inserted, and refer to this map at each point of the lesson.

Notes of a lesson on 'Latitude and Longitude, as shown on a globe.'.

Meaning—Examine a globe—lines are found drawn from top to bottom, and round it—the important one round the middle, named the *Equator*—8 lines parallel to that above and 8 below—all circles, getting smaller as they near the poles—*Explain why*—called parallels of latitude show in degrees, minutes, seconds (*'division of circles' to be explained*), the distance of places reckoned in degrees, 1° to 90° from Equator—places above being in north latitude—places below in south latitude; look for these remarkable parallels, tropics of Cancer and Capricorn, Arctic and Antarctic circles (*these terms to be explained*).—Lines drawn from N. to S., called meridians (*why?*) all same size—all great circles—(*why?*) being all the same, a special one chosen to reckon from, called a "*first meridian*"—places reckoned at so many degrees, etc. E. or W. of first meridian, till they meet at 180°—the British choose for their first meridian, the one passing through Greenwich Observatory; the French, the one through Paris. Other countries, generally the one passing through the capital. (The *Knot*, geographical or nautical mile, to be explained as one minute or 21,600th part of earth's circumference at the equator.)

Usefulness of these lines.—Show that the position of a place cannot be settled by one line; but by the *crossing* of the lines any place can be fixed with the greatest accuracy. Give exercises at first in finding places whose latitude and longitude present little difficulty. Show the *convenience* of these lines in fixing the place of a shipwreck in mid-ocean, and hence a means of filling charts when latitudes and longitudes have been got—the *service* of these cross-lines to the navigator, who with proper instruments, can determine at any time his position in degrees, etc., N. or S. of the equator, and how many degrees, etc., E. or W. of Greenwich. Instance the danger of *losing the reckoning.*

2. Describe fully the islands of Sicily, Iceland, Java, and Madagascar.

Sicily is the largest island in the Mediterranean, separated from Italy by the straits of Messina. It is triangular, in shape, its former name being Trinacria or '*Three-cornered*,' its extreme length being 185 miles, and greatest breadth 120 miles. It is mountainous, the groups extending across the island from N.E. to S.W. Towards the eastern coast rises the detached group of Etna, at whose base lies the plain of Catania, the largest in the island. Few of the rivers flow continuously all the year, and none are navigable. Sicily has only two lakes. The sea around the coast abounds with fish of various kinds, the most

productive fisheries being those of the sardine, anchovy, and tunny. The minerals are numerous, but not very valuable, the most important being sulphur, which has been worked for more than three hundred years. The climate, though hot, is generally delightful; snow is never seen, except on the highest mountains, and the sky in summer is beautifully clear. Its vegetable productions embrace many tropical, as well as European plants, and it was anciently regarded as the granary of Italy. The principal articles of export are the wines of Marsala, sulphur, fruits, and olive-oil. The chief towns are *Palermo*, *Messina*, *Catania*, *Syracuse*, and *Trapani*.

Iceland.—A large island in the North Atlantic Ocean, is 300 miles long and 200 broad. Its surface is rugged and mountainous, its soil barren, and its climate severe. Volcanic eruptions are frequent in many parts, Mount Hecla the chief volcano, of which many eruptions have been recorded. Springs of hot water are numerous, the most famous being the Great Geyser, which throws columns of water 90, 100, and sometimes even 150 feet high. The island is thinly peopled. The people were anciently distinguished in literature, and they are still intelligent, hospitable, and of very simple manners. The chief town is *Reykiavik*.

Java, a large island of the Eastern Archipelago, extends from E. to W. about 600 miles, with an average breadth of 100 miles, and is traversed through nearly its whole length by a range of volcanic mountains, volcanoes being more numerous in this island than in any other country of equal extent in the world. The climate is characterised by great heat in the plains, and by numerous earthquakes and thunderstorms. The range of vegetation is very great, and this is the only island of the great archipelago of which the *teak-tree* is a native. The much-talked-of *upas-tree* grows in its woods, its juices destroying animal life when they enter the system, but otherwise doing no injury to the surrounding vegetation. Java is the granary of the archipelago, rice being the principal grain. Animals comprise tigers, tiger-cats, rhinoceroses, buffaloes, crocodiles, and serpents. The chief towns are *Batavia*, *Samarang*, and *Sourabaya*.

Madagascar, the only large island of Africa, and the sixth largest in the world, is situated in the Indian Ocean, east of the Portuguese possessions, from which it is separated by the broad channel of Mozambique. Its area is about four times that of England. It is divided into a number of small states, which are subject to one sovereign, whose capital is Atananarivo, near the centre of the island. A chain of mountains traverses the island from N. to S. Minerals are plentiful, and coal is used in smelting the iron. Wild animals are few, but they comprise lemurs, a kind of ape peculiar to the island. The chief vegetable productions are medicinal plants, pepper, cotton, indigo, sugar-cane, and tobacco. The language is a branch of a very singular family of languages, exceeding in simplicity and phonetic structure all other languages in the world. For example, most of them have but ten consonants, while none of them allows a syllable to close with a consonant or begin with more than one.

SECOND PAPER.

One hour allowed for Females.
Two hours and a-half allowed for Males.

History.

1. When was Wales incorporated with England, and by whom was Ireland raised to the dignity of a kingdom?

In 1536, under Henry VIII., Wales was incorporated with England, and the English laws and liberties were granted to the inhabitants. Ireland was also brought under a somewhat stronger rule; and in 1542 it was raised to the dignity of a *kingdom*, having been formerly styled only a *lordship*.

2. When was the Habeas Corpus Act passed, and what are its provisions? Is it ever suspended, and with what object?

The *Habeas Corpus Act* was passed 1679, in the reign of Charles II.

The object of this Act was effectually to provide that no man should be long detained in prison on a criminal charge without either the legality of his imprisonment being proved in open court, or his being brought to trial.

In times of great public danger the operation of this Act is sometimes suspended by Parliament giving the Government power for a limited period to imprison suspected persons without bringing them to trial. It is suspended in Ireland at present for eighteen months on account of the very disturbed state of that part of the British Empire.

3. Who was the last Prince Regent? When and under what circumstances did he acquire that position?

The last Prince Regent was George IV., when Prince of Wales. George III. was afflicted with fits of insanity, and at last, about 1811, he permanently lost his reason, from which time his reign may be reckoned as at an end in all but name, the Prince of Wales ruling in his stead as Regent.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Harpsichord*.

Write in small hand, as a specimen of copy-setting, *Poised in mid-air upon the giddy mast.*

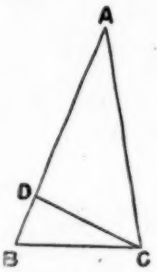
Composition.

Write an account of any book (not a lesson book) which you have recently read with interest.

Euclid.

[All generally understood abbreviations for *words* may be used.]

1. If A be the vertex of an isosceles triangle ABC, and CD be perpendicular to AB, the squares on the three sides are together equal to the square on BD, twice the square on AD, and thrice the square on CD.



By I. 47, the sq. on AC = sqs. on AD, DC, but AB = AC. ∴ the sqs. on AC, CB = 2 sq. on AD, and 2 sq. on DC. Now the sq. on BC is equal to the sqs. on BD, DC. ∴ the sqs. on the three sides AC, AB, BC are equal to the sq. on BD, twice the sq. on AD, and three times the sq. on D. C.—Q. E. D.

2. Let AB be divided into any two parts at C. Then rect. AB, BC = rect. AC, BC, together with sq. on BC.—See Prop. 3, Bk. II.

3. If a straight line be divided into two equal, and also into two unequal, parts, the sqs. on the two unequal parts are together double of the sq. on half the line, and of the sq. on the line between the points of section.—See Prop. 9, Bk. II.

Algebra.

1. Find the value of $\frac{x+y-1}{x-y+1}$ when $x=\frac{a+1}{ab+1}$, $y=\frac{ab+a}{ab+1}$

Substituting for x and y

$$\frac{\frac{a+1}{ab+1}+\frac{ab+a}{ab+a}-1}{\frac{a+1}{ab+1}-\frac{ab+a}{ab+1}+1}=\frac{\frac{a+1+ab+a-ab-1}{ab+1}}{\frac{a+1-ab-a+ab+1}{ab+1}}$$

$$=\frac{2a}{2}=\underline{a}.$$

2. Solve the equations:—

$$(1)\ \frac{3x+2y}{56}-1=\frac{2x+3y}{54}$$

$$(2)\ \frac{x}{x+3}+\frac{x+3}{x}=2\cdot9.$$

(1) $\frac{3x+2y}{56}=1$, or $3x+2y=56$, or $6x+4y=112$

$\frac{2x+3y}{54}=1$, or $2x+3y=54$, or $6x+9y=162$

By subtraction $5y=50$

$y=10$

∴ by substitution $x=\underline{12}$

(2) $\frac{x}{x+3}+\frac{x\times3}{x}=2\cdot9$

Clearing of fractions, $10x^2+10x^2+60+90x=29x^2+87x$
Changing sides, $20x^2-29x^2+60x-87x=-90$
Collecting $9x^2+27x=90$
Dividing by $9x^2+3x=10$
Completing the square, $x^2+3x+2\cdot25=12\cdot25$
Taking root, $x+1\cdot5=\pm3\cdot5$
$x=\pm3\cdot5-1\cdot5=\underline{2 \text{ or } -5}$

3. A man holds some land at £150 a year; he retains 15 acres for his own use, and lets the rest for building at 10s. per acre more than he gave for it. By so doing he just paid his rent. How much land did he let?

Let x = No. of acres; then $£\frac{150}{x}$ = price of 1 ac. in pounds.

„ $x-15$ = No. of acres let; and $£\frac{150}{x} + £\frac{1}{2}$ = increased price of 1 ac.

therefore the equation is $£\left(\frac{150}{x}+\frac{1}{2}\right)\times(x-15)=£150$.

Multiplying and clearing of fractions—

$$x^2+285x-4500=300x$$
$$x^2+285x-300x=4500$$
$$x^2-15x+(7{\cdot}5)^2=4500+56{\cdot}25=4556{\cdot}25$$
$$x-7{\cdot}5=\pm67{\cdot}5$$
$$x=7{\cdot}5\pm67{\cdot}5=75 \text{ acres.}$$

∴ he lets 75 − 15 or 60 acres.

Mensuration.

1. The sides of a right-angled triangle are 11 and 60; prove that the equilateral triangles described on them are together equal to the equilateral triangle described on the hypotenuse.

Hyp. of right-angled triangle $=\sqrt{11^2+60^2}=\sqrt{121+3600}=\sqrt{3721}=61$.

Area of equil. triangle with side 11 $= 11^2\times{\cdot}433 =$ 52·393
„ „ „ 60 $= 60^2\times{\cdot}433 =$ 1558·800

Sum of triangles on sides = 1611·193

Area of equil. triangle with side 61 $= 61^2\times{\cdot}433 =$ 1611·193 = sum of equil. triangles on sides. Q. E. D.

Note.—·433 *is the approximate area of an equilateral triangle whose side is* 1.

2. The circumference of a circle is 24 ft. 9 in.; express its diameter as the fraction of a chain.

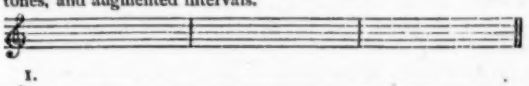
Diameter of circle $=\frac{\text{circumference}}{3{\cdot}1416}=\frac{24{\cdot}75 \text{ ft.}}{3{\cdot}1416}$ which expression reduced to the fraction of a chain (66 ft.) is

$$\frac{24{\cdot}75}{3{\cdot}1416\times66}=\frac{2{\cdot}25}{3{\cdot}1416\times6}=\frac{{\cdot}375}{3{\cdot}1416}=\underline{{\cdot}11936.}$$

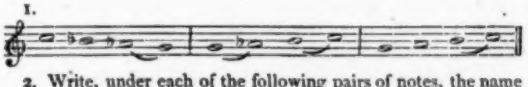
Music.

A quarter of an hour allowed for this Paper.

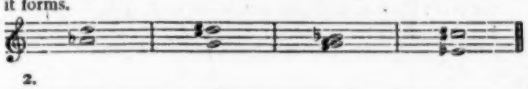
1. Write the upper tetrachord of C (*Do*) minor, in every form with which you are acquainted. Mark the places of the semitones, and augmented intervals.



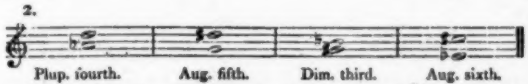
1.



2. Write, under each of the following pairs of notes, the name and quality (major, perfect, diminished, or other) of the interval it forms.

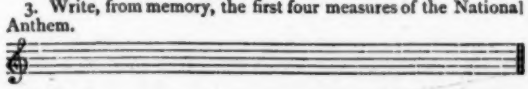


2.

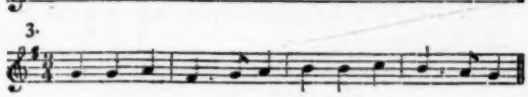


Plup. fourth. Aug. fifth. Dim. third. Aug. sixth.

3. Write, from memory, the first four measures of the National Anthem.



3.



Matriculation Chemistry.

BY E. W. V. VOLCKXSOM,

Lecturer on Chemistry at St. Gregory's College, Downside, Bath.

66. The preparation and properties of **oxygen** gas. *July*, 1846.

Give an account of the properties of one of the principal constituents of the atmosphere, namely, **oxygen**. *July*, 1850.

Give an account of the preparation and describe the properties of **oxygen** gas. *July*, 1854.

The preparation of oxygen gas has been given in the previous numbers. We shall now give its properties.

Oxygen is a colourless invisible gas, possessing neither taste nor smell. It exists free in the atmosphere, of which it constitutes about one-fifth in bulk. It forms eight-ninths by weight of water and nearly half the weight of the solid earth. It was till lately believed that it was impossible to reduce it to the liquid state, but two Swiss chemists* have recently shown that notion to be false. **Oxygen** is a little heavier than air. Its specific gravity compared with air is 1·10563. **Oxygen** is necessary to animals in breathing and is essential in all cases of ordinary combustion: it is therefore said to be *a supporter of combustion*. Bodies which burn in the air burn in **oxygen** with greatly increased splendour. If a taper be blown out and introduced into the gas while the wick remains red-hot, it is instantly rekindled. This effect is highly characteristic of **oxygen**, there being but one other gas, **nitrous oxide** (N_2O), which possesses the same property. Lastly, all the elements with the exception of fluorine form compounds containing **oxygen**.

67. How many cubic centimetres of **oxygen** are contained in 100 cubic centimetres of **air**, and how many cubic centimetres of **hydrogen** would be burned by this quantity of **oxygen**? *June*, 1869.

It is found from careful analysis of air that in 100 parts of **air** there are 21 parts by volume of **oxygen** and 79 parts by volume of **nitrogen**. Hence in 100 cubic centimetres of **air** there are 21 cubic centimetres of **oxygen**.

With regard to the second part of the question, we know that **hydrogen** is completely burned by **oxygen** in the proportion by volume of 2 to 1. Hence to burn 21 cubic centimetres of **oxygen**, 42 cubic centimetres of **hydrogen** will be required.

68. How would you extract **oxygen** from **water**? Explain your process. *Jan.*, 1873.

Water is decomposed into **oxygen** and **hydrogen** by electricity. The equation for the reaction would be:—

$$\underset{\text{water.}}{2H_2O} = \underset{\text{hydrogen.}}{2H_2} + \underset{\text{oxygen.}}{O_2}$$

For the explanation of the process see No. 98 in Chapter III.

Also if a stream of **chlorine** be passed through a flask of boiling **water** it will escape by the exit-tube

* Pictet and Caillet.

saturated with vapour of **water**. If the exit-tube be connected with a glass tube filled with fragments of glass or pumice heated to redness by a furnace, a chemical change takes place by which a mixture of oxygen and hydrochloric acid is produced; and if this mixture passes through the water of the pneumatic trough, the hydrochloric acid is dissolved and the **oxygen** may be collected. The following represents the reaction.

$$\underset{\text{water.}}{2H_2O} + \underset{\text{chlorine.}}{2Cl_2} = \underset{\text{hydrochloric acid.}}{4HCl} + \underset{\text{oxygen.}}{O_2}$$

69. How is **oxygen** distinguished from **nitrogen** and from **protoxide of nitrogen**?—*Jan.*, 1863.

A given sample of gas is found to have the property of kindling a glowing splint of wood. Enumerate the reactions by which you would decide whether it consists of **oxygen** or **nitrous oxide**. *Jan.*, 1870.

How would you distinguish **nitrous oxide** from **oxygen**? *June*, 1874.

Oxygen would be instantly distinguished from **nitrogen** by lowering into the vessel containing the gas a freshly extinguished taper. If the vessel contains **oxygen** the taper will be instantly rekindled, whereas if the gas be **nitrogen** the red-hot wick or even a lighted taper will be at once extinguished.

Now this same test will be of no avail with regard to **protoxide of nitrogen** (N_2O), because **oxygen** and **protoxide of nitrogen** have in common the property of strongly supporting combustion. **Nitric oxide** forms brown fumes with **free oxygen**, and *not* with any other gas. Therefore, to distinguish **oxygen** from **protoxide of nitrogen** (nitrous oxide), pass into both a little nitric oxide. It will produce brown fumes in the **oxygen** and *not* in the **nitrous oxide**.

Also, a solution of **potassic pyrogallate** absorbs **free oxygen**, becoming black at the same time. If, therefore, a few drops of the solution of pyrogallate of potash be shaken in jars of the two gases, it will become black in the **oxygen** and *not* in the **nitrous oxide**.

70. How much **oxygen** is contained in 10,000 grains of **potassic dichromate** ($K_2Cr_2O_7$)? K = 39; O = 16; Cr = 52·5. How much **oxygen** is given off when the same quantity of the salt is heated with an excess of oil of vitriol? *June*, 1865.

Potassic dichromate:

$K_2 = 2 \times 39 = 78$
$Cr_2 = 2 \times 52{\cdot}5 = 105$
$O_7 = 7 \times 16 = 112$

295 = molecular weight

In 295 parts of $K_2Cr_2O_7$ there are 112 parts of O

$\therefore$ in 10,000 do. $\frac{112 \times 10{,}000}{295} = 3796{\cdot}61$ do.

$\therefore$ the first answer is 3796·61 grains.

The equation representing the reaction is:—

$$\underset{\text{potassic dichromate.}}{2K_2Cr_2O_7} + \underset{\text{hydric sulphate.}}{10H_2SO_4} = \underset{\text{hydric potassic sulphate.}}{4KHSO_4} + \underset{\text{chromic sulphate.}}{2Cr_2(SO_4)_3} + \underset{\text{water.}}{8H_2O} + \underset{\text{oxygen.}}{3O_2}$$

i.e., two molecules of potassic dichromate containing 14 atoms of oxygen yield 6 atoms of **oxygen**, which is three-sevenths of the contained oxygen, that is,

$\frac{3}{7}$ 3796·61 = 1627·12.

$\therefore$ the second answer is 1627·12 grains.

71. Name the substances which are formed when **carbon**, **hydrogen**, **phosphorus** and **sulphur** respectively are burned in an excess of **oxygen**. *June*, 1865. —*June*, 1867.

When **carbon** is burned in an excess of **oxygen**, **carbonic dioxide** is formed:—

$$\underset{\text{carbon.}}{C} + \underset{\text{oxygen.}}{O_2} = \underset{\text{carbonic dioxide.}}{CO_2}$$

When **hydrogen** is burned in an excess of **oxygen**, **water** is formed:—

$$\underset{\text{hydrogen.}}{2H_2} + \underset{\text{oxygen.}}{O_2} = \underset{\text{water.}}{2H_2O}$$

When **phosphorus** is burned in an excess of **oxygen**, **phosphoric pentoxide** is formed:—

$$\underset{\text{phosphorus.}}{P_4} + \underset{\text{oxygen.}}{5O_2} = \underset{\text{phosphoric pentoxide.}}{2P_2O_5}$$

When **sulphur** is burned in an excess of **oxygen**, **sulphuric dioxide** is formed:—

$$\underset{\text{sulphur.}}{S_2} + \underset{\text{oxygen.}}{2O_2} = \underset{\text{sulphur dioxide.}}{2SO_2}$$

72. A watch-spring is burned in a closed vessel of **oxygen**. State (*a*) whether the weight of the bottle and its contents is affected by the combustion; (*b*) what is the nature of the product formed by the combustion; (*c*) whether the grey, metallic-looking globules found at the bottom of the bottle after the experiment consist of metallic iron; (*d*) whether the whole of the oxygen originally filling the bottle is still present, and, if so, in what form. *January*, 1874.

A steel watch-spring, having a bit of lighted amadou (*German tinder*) fixed to its extremity, when introduced into a vessel of oxygen gas exhibits a most beautiful phenomenon of combustion. The **oxygen** here combines with the iron, and the heat evolved in combination is so great that the fused globules of black iron oxide (Fe_3O_4), after falling through half an inch of water, fix themselves in the plate in which the jar stands.

(*a*) The weight of the bottle and its contents is not affected by the combustion.

(*b*) Black oxide of iron (Fe_3O_4), known as magnetic oxide of iron.

(*c*) No; they consist of oxide of iron, (Fe_3O_4).

(*d*) Yes, it is all present; but a part may be free, and the remainder combined with iron.

73. Why do you consider two atoms of **hydrogen** to be equivalent to one atom of **oxygen**? *January*, 1872.

Sodium, when acted upon by an excess of water, sets free some of the **hydrogen** of the water, and the remainder of the constituents of the water goes to form **sodic hydrate**; thus:—

$$\underset{\text{Sodium.}}{Na} + \underset{\text{water.}}{H_2O} = \underset{\text{sodic hydrate.}}{NaHO} + \underset{\text{hydrogen.}}{H}$$

Now, by heating the **sodic hydrate** till it fuses, and adding an excess of **sodium**, the remainder of the **hydrogen** of the water is liberated and **sodic oxide** is formed, thus :—

$$Na + NaHO = Na_2O + H$$

Sodium. sodic hydrate. sodic oxide. hydrogen.

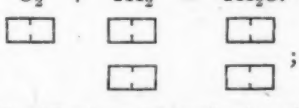
It is found, by measurement, that these two liberated quantities of **hydrogen** are equal ; therefore, in water there are two atoms of hydrogen, because no one has yet expelled it in more than two equal portions. The **oxygen** cannot be removed in parts, but all at once : we therefore say that water contains one atom of **oxygen** to two atoms of **hydrogen**.

Now, **hydrogen** combines with **chlorine**, atom with atom, since in their compound—hydric chloride—if the hydrogen or chlorine be replaced by another element, it is all replaced all at once and not by parts. This means that one atom of **chlorine** is equivalent to one atom of **hydrogen**. If in any compound chlorine replaces oxygen, two atoms of chlorine always replace one atom of oxygen ; therefore one atom of **oxygen** is equivalent to two atoms of **chlorin**, and therefore also to two atoms of **hydrogn**.

74. In what proportion by volume does **oxygn** combine with each of the following gases, viz., hydrogen, carbonic oxide, marsh gas, and olefiant gas? *June*, 1865.

Combination with **hydrogen** :—

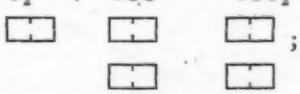
$O_2 + 2H_2 = 2H_2O$.



; *i.e.*, 1 vol. : 2 vols.

Combination with **carbonic oxide** :—

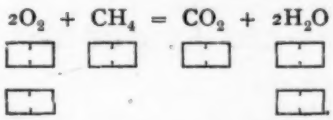
$O_2 + 2CO = 2CO_2$



; *i.e.*, 1 vol. : 2 vols.

Combination with **marsh gas** :—

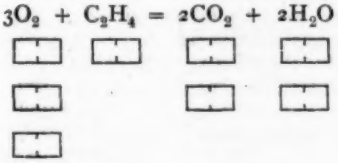
$2O_2 + CH_4 = CO_2 + 2H_2O$



; *i.e.*, 2 vols. : 1 vol.

Combination with **olefiant gas** :—

$3O_2 + C_2H_4 = 2CO_2 + 2H_2O$



; *i.e.*, 3 vols. : 1 vol.

75. Describe how you would prepare pure **oxygen**, and give an outline of the leading properties of this element. *January*, 1871.

The answer to the first part of this question will be found in No. 65, and that to the second part in No. 66.

76. **Oxygn** is said to be a permanent gas and a great supporter of combustion. Illustrate each statement by a description of one or two experiments. *June*, 1872.

The term permanent gas is *generally* used in contradistinction to a readily condensible vapour. That **oxygen** is a permanent gas, that is to say impossible to be liquefied by any means at present at our disposal, has been proved to be false by two famous Swiss chemists, only a short time ago.

That **oxygen** is a supporter of combustion is easily proved from the following facts. If a glowing wood-splint be plunged into a vessel of oxygen it at once bursts into flame. A candle and a fire burn in air by virtue of the oxygen which the air contains. If a candle be burned in a closed glass vessel it will continue alight for a short time, and will then be extinguished because all the oxygen has been used.

77. Describe the preparation of **oxygen** from **potassic chlorate**. How many ounces of oxygen can be obtained from 115 ounces of potassic chlorate? *January*, 1879.

The first part of this question has been answered in No. 60. The equation representing the reaction is :—

$$2KClO_3 = 2KCl + 3O_2$$

Potassic chlorate. potassic chloride. oxygen.

245 = 149 + 96

Thus we have—

$\therefore$ 245 ozs. of potassic chlorate yield 96 ozs. of oxygen,

$\therefore$ 1 " " $\frac{96}{245}$ " "

and 115 " " $\frac{96 \times 115}{245}$ " "

$= 45{\cdot}06$ ozs.

78. Explain, by means of symbols, the decomposition of **mercuric oxide** by heat. *June*, 1879.

Mercuric oxide is decomposed by heat into its two elements, **mercury** and **oxygen**, according to this equation :—

$$2HgO = 2Hg + O_2$$

Mercuric oxide. mercury. oxygen.

79. How would you distinguish **oxygen** from common air? *June*, 1867.

A taper, with the wick red-hot, will burst into flame in **oxygen**, but not in air. **Nitric oxide** forms, with free oxygen, brown fumes, which are readily soluble in water. If, therefore, a few bubbles of that gas are passed into a jar containing air and placed over a pneumatic trough, brown fumes arise. These are at once dissolved in the water, which rises in the jar one-fifth of the height. If the jar contain pure oxygen, the water will rise nearly to the top.

Instead of nitric oxide and water, a solution of **pyrogallate of potash** or a stick of phosphorus may be used in a similar manner.

80. Name the substances which are formed when carbon, hydrogen, sulphur and phosphorus are respectively burned in an excess of **oxygen.** Which of the following bodies can be burned in oxygen :—Sulphur, nitrogen, coke, sulphurous acid, wax, iodine, chlorine, and ammonia? *June*, 1867.

For the solution of the first part of the question see No. 71.

With regard to the second part, sulphur, coke, wax, and ammonia can be burned in **oxygen**; the others cannot.

—o—

Recent Inspection Questions.

[*The Editor respectfully solicits contributions—all of which will be regarded as* STRICTLY PRIVATE—*to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

Arithmetic.

STANDARD I.

(1) Add together ninety-seven, eight hundred and seventy-nine, four, nine hundred and nine.

Ans. 1889.

(2) From six hundred and forty-three, take four hundred and thirty-seven. Ans. 206.

(3) Find the difference between one thousand and two hundred and forty-three. Ans. 757.

STANDARD II.

(1) From thirty thousand four hundred and one, take three thousand and ninety. Ans. 27,311.

(2) Divide forty-five thousand and ninety-one by eight. Ans. 5,636—3.

(3) Multiply forty-nine thousand eight hundred and sixty-four by nine. Ans. 448,776.

(4) Multiply thirty-nine thousand and eighteen by forty-seven. Ans. 1,833, 846.

STANDARD III.

(1) Add together eight hundred and fifty-nine thousand nine hundred and fifty-eight pounds seventeen shillings and elevenpence halfpenny, one million pounds and tenpence three farthings, seven hundred and seventeen thousand and seventy pounds nineteen shillings and ninepence farthing, and eight hundred thousand eight hundred and five pounds fifteen shillings and sevenpence farthing. Ans. £3,377,835 14s. 2¾d.

(2) From five hundred thousand five hundred pounds and ten shillings, take fifty thousand and fifty pounds nineteen shillings and a farthing.

Ans. £450,449 10s. 11¾d.

(3) Divide twenty-eight millions, forty-five thousand three hundred and seventy-six, by five hundred and ninety-six. Ans. 47,056.

STANDARD IV.

(1) Multiply twenty thousand and sixty-eight pounds eighteen shillings and elevenpence three farthings by one hundred and twenty-six.

Ans. £2,528,687 11s. 4½d.

(2) Reduce two tons, fifteen cwt., 2 qrs., fifteen pounds, fifteen ozs. to drams. Ans. 1,595,376 drams.

(3) 36 men are sent to mow a field of six acres, two roods, thirty-six poles, twenty-three yards; how many square yards should each man mow?

Ans. 904 sq. yds., 7 sq. ft.

STANDARD V.

(1) Find by practice the value of 6550 at 7s. 10¼d. Ans. £2,572 4s. 9½d.

(2) 19 days, 7 hours, 24 minutes at £5 5s. per day of 24 hours. Ans. £101 7s. 4½d.

(3) Make out this bill in proper form :—

18 gals. of beer at 2¼d. per pint.
5 pints of porter at 2s. 6d. a gallon.
6½ dozen claret at 18½d. per bottle.
21 gals of sherry at £26 15s 6d. per hogshead of 63 gals. Ans. £16 7s. 3¾d.

(4) If the rent of 100 acres be £157 10s., how much should I pay for 50 acres? Ans. £78 15s.

STANDARD VI.

(1) A servant's wages are £11 a year (365 days). If she leaves at the end of 31 weeks and 2 days, how much ought she to receive? Ans. £6 12s.

(2) If 24 horses plough 11 acres in 5 days, how many horses would be required to plough 33 acres in 36 days? Ans. 10 horses.

(3) Add $\frac{5}{6} \times 3\frac{1}{6}$, $\frac{5}{8} \times 1\frac{3}{5}$, $\frac{7}{12} \times 4\frac{4}{9}$, and from the sum of these take $6\frac{1}{2}\frac{5}{7}$. Ans. $\frac{1}{10}\frac{1}{5}$.

(4) Multiply 10·375 by ·0074, and subtract the product from ·76775. Ans. ·690975.

(5) Subtract ·05625 of a pound from ·05̇ of a guinea. Ans. ½d.

Grammar.

STANDARD IV.

(1) Parse :—

(*a*) What answer will you give this base man?

(*b*) Then long may the oak and ivy stand.

STANDARD V.

(1) Parse and analyse :—

(*a*) Sons of the ocean isle, where rest your mighty dead?

(*b*) Up! up! let us a voyage take.

(2) Parse the words underlined :—

The ground on which we stood was wet.

(3) Analyse :—

Here is our house.

STANDARD VI.

(1) Parse and analyse :—

(*a*) Nothing can be taken out of a bag that was not first put in.

(*b*) I can give the loser leave to chide.

Find indirect object; parse *can give.*

Express in different words the meaning.

(2) Write out imperative mood.

Dictation and Composition.

STANDARD I.

above	**snow**	**black**	**white**
cotton	**great**	**large**	**square**
silk	**watch**	**fine**	**round**
glove	**chain**	**body**	**water**
rain	**hand**	**dinner**	**money**

STANDARD II.

I have heard a story of a man who set out on a long journey to a town. He saddled his horse, and on looking at its feet, he noticed that one of the shoes wanted a nail, but he said, 'It does not matter; it's only one.'

STANDARD III.

They choose a clump of trees which stands away from other trees. They see that it is large enough for all their homes, and then they build up at their very top. Here they make a little town of their homes. Through many generations parent and children rooks live in the same place, family connections never being broken.

STANDARDS IV. AND VI.

Write a letter on any of the following subjects:—

(1) The sea.
(2) The finest place you have ever seen.
(3) The animals of England.
(4) The seasons.

STANDARD V.

Write from memory the substance of the passage read to you by the inspector.

—o—

Publications Reviewed.

*** We are sorry to disappoint the many friends who desire us to quote the price of each work noticed in our columns. This we would respectfully point out is the publishers' duty and not ours; we give publicity enough to a book when we review it. Our readers should peruse the advertisements in our pages, and failing to find the price here, it would be no great trouble or expense to drop a line to the publishers whose name and address we will gladly give.

The Temptation of Job, and other Poems.

By Ellen Palmer. London: Philip and Son, 32, Fleet Street.

Poetry, or what passes under that much injured name, is at present very unpopular amongst us, both with editors and readers; and no wonder if this little book could honestly be made to pass muster as a fair sample of the art divine.

We are unwilling to be hard upon the writer, who as a well-meaning lady (whether matron or spinster we know not) comes forward, not for the first time, as an authoress; but if she will force her 'poems' upon the public, she must abide the critic's honest verdict just as if she were nothing more than a man. We are obliged, then, to state (and we will justify our opinion by extracts) that, considered as 'poetry,' this very bald and clumsy paraphrase of the sublime book of Job is deficient in the first elements of rhyme and rhythm. Take these examples:—

P. 20—

'For though my God should slay me, yet will I trust in Him.
But mine own ways I will maintain, I must maintain to Him:
For my salvation He shall be. No hypocrite shall stand
Before His face; and well I know that I shall understand
My ordered cause, and justified shall be,
When He shall call and I reply, reply, my God, to Thee.'

Again, p. 26—

'And though my body be destroyed by worms, yet I shall see,
See in my flesh, yes, see my God, whom I shall surely see
With mine own eyes. But fear ye then the sword,
For wrath shall bring its punishment, the keen, avenging sword;
And ye shall know, most surely know, know in that latter day
There is a judgment. Thus Job rose to clearer faith that day,'
etc., etc.

Can this 'poetess' be unaware that to rhyme words by themselves is to offend against the first rule of English versification? Rhymes must be similar, but may not be exactly alike. And this fault pervades the whole paraphrase: we have 'guile' and 'beguile,' 'given' and 'forgiven,' 'there' and 'there,' 'arose' and 'arose,' 'heart' and 'heart,' 'said' and 'said,' etc., etc.; in fact, as to the important point of rhyme a fatal deficiency is proved.

And equally is the rhythm of our authoress continually at fault: she changes at will from tens to twelves, sometimes from fourteens to eights, in the most unmelodious and distracting fashion:—

'For well He knows that I have kept His ways, and not declined
From His commandments. To my mind
His laws were as my food: but who can stay
Or turn Him from His determined way?
Yet, God forbid I own you just. No, for until I die
My righteousness I will hold fast, and my integrity,' etc., etc.

Is this enough? But the whole of Job's Temptation is full of the like inharmonious and faulty rhythm, as also is another so-called 'poem' on Earl Osmond, which, after a wearisome score of pages of equally degraded blank verse, ends thus:—

'Deep, thankful prayers rose upwards, and with a mingled strain
Of holy fear. Keep me, my heavenly Father, Osmond cried,
Keep me Thine still; with every gift O give Thyself,
Thy Spirit, Lord, to teach me how to use and keep them all!
Make me now poor in spirit, leaning upon Thee
For all my strength; and if in mercy Thou hast laid
The burden of "the Rich man" on my soul, yet I believe I know
That unto Thee all things are possible, and trusting Thee,
I hold my burden as a Talent, held to be restored
In that great day when Rich and Poor shall meet
To hear their final sentence from Thy judgment-seat.'

But it would exercise the patience of Job himself in the present critic and his readers to demonstrate further how hopelessly wanting in the very elements of poetry is this would-be poetess. Neither is this quite the worst we have to say of her. Prosody and accentuation are nowhere, as evidenced in her pronunciations, as thus:—

'While Elīphaz, to whom his words seemed wild, presumptuous breath.'
'When Arctūrus and Pleiades beam with soft, sacred light.'
'But Elihu, the man of God on whom the Spirit fell.'
'God's pirit spoke by Elihu, and eased His servant's pain.'
'Hast thou not taken for thine hope thine uprightness of life?'

Why not 'righteousness'? But it is needless further to expend strength in 'breaking a butterfly on the wheel.'

Let us, for an end, expose a piece of unacknowledged plagiarism, utterly spoiled in the copying. Edgar Poe's 'Bells' is, as all know, a most melodious and graphic poem, whereof, as a sample, we give this stanza:—

'Hear the mellow wedding bells,
Golden bells!
What a world of happiness their harmony foretells!
Through the balmy air of night
How they ring out their delight!
From the molten golden notes,
And all in tune,
What a liquid ditty floats
To the turtle-dove that listens while she dotes
On the moon!
Oh, from out the sounding cells
What a gush of euphony voluminously wells!
How it swells,—
How it dwells
On the Future! how it tells
Of the rapture that impels
To the swinging and the ringing
Of the bells, bells, bells,
To the rhyming and the chiming of the bells!'

There sings the true poet: now let us patiently hear out his imitator:—

'Listen to the wedding bells,
To the music of the wedding bells,
To the merry, merry wedding bells,
To the joyous, gladsome wedding bells!
They are singing of the might,
Born of unity and love,
Born of sacred wedded love,
And the harmony of love,
And the victory of love.
O those love-inspiring wedding bells!
Every sweet vibration tells
Of the great Creator's mystery; it rises and it swells,
Imploring Benediction, through the sacred wedding bells!'

In conclusion, we might have been more indulgent, even unto a friendly silence, if this booklet of 124 pages had been the author's first work; but when we find it forced upon us that she has published six others, presumably no better than Job's Temptation, we feel that in the interests of educational literature we cannot leave such so-called poetry to pass muster uncondemned.

Farnsworth's Domino Cards. Manchester: J. B. Ledsham.

Arithmetic is the 'common logic' of the people, and, as one of the 'three R's,' is enforced in the public elementary schools of this country. The method by which this subject is taught must largely determine its value as an instrument of education, and on the early processes of instruction will depend generally all subsequent development. Unlike some other subjects, arithmetic to be really useful demands a clear conception and a definite understanding of each step before another can be advantageously taken. Hence the 'first four rules.' But this is a misinterpretation, if subtraction is made to follow addition, and multiplication is then made to precede division. A common mistake has been to take these 'rules' in the order indicated, and even to require the addition of long columns of figures including 'millions' before proceeding to subtraction. This practice is now discarded by all intelligent teachers of young children, and an appeal to their observation—to their 'intuition'—by the presentation of *objects* has happily been substituted. The abacus or ball-frame was long the only 'apparatus' found in our infant schools adapted to this purpose, although, of course, ingenious teachers used laths, pebbles, and other appliances to aid in the correct conception of any given number. Other devices have been recently supplied, each affording some valuable suggestion. The most recent is the special adaptation of the arrangement of the domino 'dots' to the purposes of instruction in number. Farnsworth's Domino Cards give, on a large scale, the familiar double arrangement of numbers up to *nine*. The groups of dots, always presented in the same order, are themselves the unvarying symbols, and need no immediate translation into 'Arabic numerals.' This great advantage of *ready* representation 'in the concrete' of all numbers less than ten in every possible combination gives to these fifty-four cards an unspeakable value. Children can learn to add, subtract, multiply and divide with exactness and rapidity, 'up to eighteen,' by the use of *single* cards; and two or more cards can be employed as effectively for more advanced exercises. On the basis of a knowledge of number thus firmly laid may be erected an enduring superstructure. Our opinion is confirmed by the testimony of H.M. Inspector, John Lomax, Esq., M.A., who records, with satisfaction, that 'remarkable accuracy and quickness in the teaching of numbers has been secured' in the Infant School at Stockport, where these Cards have been introduced. We confidently commend these Domino Cards.

An Elementary Text-book of Botany. Translated from the German of Dr. K. Prantl. The Translation revised by S. H. Vines, M.A., D.Sc., F.L.S. W. Swan Sonnenschein and, Co., Paternoster Row.

It is a question whether the library of the scientific Englishman is not becoming a little over-burdened with translations from the German. All the world knows that the Germans are *facile principes* in that immense faculty of taking pains that is one great requisite of genius of a natural science order. Their patient investigations during the last few years in Physiology, Zoology, and Botany have revealed more actual facts as to plants and animals than have been furnished in the same time by any other nation. We owe them a heavy debt of gratitude for the vast store of materials they have accumulated. But we are not sure that in their admiration of German industry the English scientific folk are not becoming a little slavish. An idea seems to have arisen that translations from the German are the only reliable scientific books, and that any work of purely English origin would not be sufficient for the study of a given subject. And as far as Botany is concerned the leaders in the scientific world seem to encourage this notion. Not one of our foremost English botanists has brought out an original work of any magnitude on the subject during the last twenty years. Professors Thiselton Dyer, and Bennet translate Sachs, Lehrbuch in place of giving us a work from their own pens, and Mr. Bennet further translates Otto Thomé's book.

Dr. Vines, in his turn, translates Prantl's work. Professor Bentley's book, in its later editions, deviates but little from the first edition, that was published in 18—. Truly Dr. Maxwell Masters, in his excellent re-editing of 'Henfrey,' gives us all the latest facts and theories. But these are still arranged on the basis of the work of 1857.

The English Botany book is yet to be produced. Before long probably some English scientific man will give us a work in which all the many facts collected by the indefatigable patience of foreign observers and their generalizations will be collected and arranged, in that systematic and tangible manner which would seem to be the special prerogative of our English writers.

In the main the book before us would serve very well for the student who has studied plants practically, and who is not yet sufficiently skilled to comprehend the large work of Sachs. This volume should be taken as the intermediate stage between that practical dissection and description of plants that must be the first step in Botany, and the reading of the highest treatises. Dr. Prantl deals, after the fashion of modern botanists, largely with the Cryptogamia. The fashion is an excellent one, for larger, more interesting, and more important generalizations are probably to be arrived at by the study of low plants than by the study of the more complex forms. The whole question of the evolution of plants, and of the gradual separation of vegetable living things from animal living things in the course of development, turns on the knowledge of these low forms of plant life. Hence the modern teacher of Botany who does his work well early leads his students to study the Cryptogamia. He will find in this volume a very excellent account of that sub-kingdom, and in addition some useful practical hints as to the locale and the habitat of the commoner forms of these flowerless plants. Some of these hints, we take it, are from the pen of Dr. Vines, as they have in many cases an English rather than a German significance. With advancing botanical knowledge comes the necessity for the modification of those purely artificial arrangements that we make of plants and animals to aid us in our remembrance of their structure, their functions, and their relations one to another. Our systems of classification need reconstructing, and in this constantly recurring reconstruction we are sometimes likely to forget the immensely important fact that all systems of classification are artificial, and that in Nature there is no such thing as a class, or an order, or a genus. So long, however, as we bear in mind that divisions and subdivisions are of man's making, and are only convenient ways of tabulating, and aids to remembering facts, classification will be of use to us. The system adopted by Professor Prantl differs largely from that hitherto in vogue in England.

The classification of the Cryptogamia is a thoughtful and reasonable one. We regret, however, that one piece of nomenclature introduced by Messrs. Bennet and Murray at the meeting of the British Association in 1880 has not been incorporated here. That is the careful distinction between the use of the ending 'spore' and the ending 'sperm.'

We should take exception further to the placing of Characeæ as a division of the Algæ. There is in this division of plants a marked distinction between axis and appendages that is not presented by any other of the

plants classed under the head of Algæ. If morphological distinctions are of any value in classification, surely so striking a one as this ought to serve to separate Chara and Nitella from all the plants in which there is no distinction between a central stem and the lateral appendages as the branches, leaves, and sexual organs, that are borne by that stem.

Turning to the classification of the Phænogamia, that are an admirable modification which separate the Gymnospermeæ from the Angiospermeæ *before* making division into Monocotyledones and Dicotyledones. The further subdivision of these two last classes on pages 206—229 presents many points of difference from the system at present used by English botanists, and we are not sure that in all cases the alteration is for the better.

Dr. Vines has given a very useful appendix, by the aid of which the relative positions of the English orders and the divisions of Dr. Prantl can be seen at a glance.

The account of the structure and functions of plants is excellent, though the hypercritical will take exception to the terms used in the titles of the first and second parts. Anatomy, we still think, should be a general name for the whole body of facts that bear upon structure. Its subdivisions are Morphology, the name for facts in relation to organs, and Histology, the name for the facts in relation to tissues. The book under consideration, unfortunately, speaks of the Histology of plants under the name of Anatomy.

We are inclined also to join issue with our authors in their retention of the ugly phrase, 'alternation of generations.' It is so misleading a phrase that we would suggest the use of H. Spencer's 'hetero-genesis' by all biologists, in place of the older and less accurate name.

The student who has carefully studied, by dissection and microscopic investigation, actual plants, and who desires to pursue his botanical studies in company with the best authorities by the aid of the most advanced works, will find Dr. Prantl's book of use as an intermediate stage, at least until our English botanists produce a text-book that is not a translation from a foreign author.

Standards of Teaching of Foreign Codes relating to Elementary Education. By A. Sonnenschein. London: W. Swan Sonnenschein and Allen.

'Nothing can be more serviceable to the cause of national education than that the English people should be accurately informed as to what our neighbours and competitors are doing.' Thus wrote Mr. Mundella on June 14th, 1881, on receiving proof-sheets of this useful publication. We fear that, with regard to educationists generally, it was published too late to serve its immediate purpose, which had reference to the 'Proposals for the Amendment of the Code,' which were generously submitted to public criticism. But an accurate compilation of this nature, exhibiting the standards of attainments required for school children of a given age in the chief States of Europe can only lose its value by the lapse of time. Fifteen countries are selected, and their regulations as to arithmetic, language, geography, etc., are minutely given. Though these Standards are by no means uniform, there is evidence in almost every case of their having been determined by practical men. An Introduction of fifteen pages contains some sensible strictures on certain points in our English Code, and we endorse nearly all that the author has written on the subject of 'Intuition'—the German 'Anschauung,' or 'Teaching by Observation.' We believe, with Mr. Felkin (quoted p. 17) that 'it is the most important of all kinds of instruction,' inasmuch as in the hands of a good teacher 'it forms the child's mind, and develops his powers of observation.' The 'oral lessons,' formerly so prevalent in our public elementary schools, have been almost crowded out by the mechanical drudgery of the 'three R's.' There is, however, some hope of a return to intelligent methods, especially in the work of our infant schools. We are glad to commend to the attention of all patriotic educationists what Mr. Mundella calls an admirable and valuable work. Mr. Sonnenschein apologises for its incompleteness, but so far as it goes we believe it to be reliable.

A History of Modern Europe, for Schools. By John Lord, LL.D. London: Simpkin and Marshall.

Dr. Lord's 'History of Europe' has been a school book for about forty years, and its sale has reached forty-seven thousand. This success renders lengthened notice on our part superfluous. Our duty is to intimate the addition of four supplementary chapters, bringing the book nearly to the present date; together with an appendix of questions for examination on each chapter. These supplementary chapters are not unworthy of the book, being written so as to comprise the principal of recent events, and with general fairness in regard to party politics. The questions are less able, being in many particulars too literal and commonplace. A better suggestive question on the miseries of the French retreat from Moscow might have been adopted than 'How many horses died in a week, and what was done with their remains?' Generally speaking, an answer to a question should be found in the text. We look in vain through the paragraph which describes the Great Exhibition (p. 426) for information to answer the question 'What made this (the Exhibition) a great success?' All we can gather from the descriptive paragraph on this point is, 'It was a great success,' without any hint as to the causes thereof. The author of these supplementary chapters has also mistaken the famous expression in Louis Napoleon's letter to the Empress, in which Prince Imperial is spoken of as having received his 'baptism of blood,' and this is referred to by the question, 'What was the "baptism by fire?"' We turn to the text—rather puzzling to find under the general date, 1848 to 1880—and find the phrase 'baptism of fire' spoken of as having been used in regard to the trifling affair at Saarbrück, the only gleam of success that shone on the French forces. Questions like the following also occur:—'What is the present condition of the Republic?' (of France). Rather a difficult one, we submit, to be answered by a schoolboy student. 'What are the great sources of national wealth?' we regard also as much too comprehensive. 'How has Prussia astonished the world?' might be answered in several ways; but 'What about Bismarck?' would puzzle many a politician to answer, and the following question, 'What is his policy?' drive the poor examinee to despair. The author—we still speak of these supplementary chapters—also calls (p. 461) the German Reichstag by the term Reistadt, and spells Gortschikoff with a z—Gortszikoff—both, we fancy, unusual. The author also attributes the rapid recovery of France from the disastrous effects of the German war mainly to the extensive division of the soil among small proprietors. This is very questionable. The recuperative power of France was more plainly attributable to the habits of thrift and prudence on part of the masses of the people, together with their hoarding up savings, in addition to ordinary investments, against a rainy day. The appearance of these savings in buying shares in the Rentes astonished even the great French financiers, and enabled the nation to pay off the immense German indemnity at a very early period, and without any interruption to national industry. The paper and printing of this edition are inferior to the editions issued in Dr. Lord's time. With better examination questions, and the convenience of giving the precise date to each paragraph, this book will hold its own as one of the most useful of modern histories.

Elementary Science Manuals. Botany for Schools and Science Classes. By W. J. Browne, M.A. Lond., Inspector of National Schools. Dublin: Sullivan Brothers. London: Simpkin, Mashall and Co. 1881.

This would be a very useful book to any one who had read a great many others. An advanced student in Botany

would find it of value in placing in very condensed and not altogether unsystematic form a large number of more or less valuable facts. But we cannot think that these books, that always remind us of Liebig's extract of meat, are of use in themselves to beginners. Without much, very much explanation, Mr. Browne's book must be wholly unintelligible to young students. Its most possible use would be as a text-book in the hands of a good teacher, who might well model the course and details of his lessons on the method here adopted.

To get rid of the fault-finding. Is it not to-day a pity in any scientific book, no matter how simple, to use the Fahrenheit scale in preference to the Centigrade? This is done in the volume under discussion (page 14, line 19 from end). The old-fashioned word 'pistil' is retained instead of the more accurate 'gynœcium.' Mr. Browne would probably be the first to admit that this pistil is an exploded one. Cryptograms, again, are not so called because 'their floral organs are hidden' (p. 17). The name is given to them because their sexual organs are minute and difficult of discovery. And lime is not calcium oxalate, though the student of page 20 would be led to this inference. The more recent and more meaningful terms dorsifixed and basifixed are, we think, better in relation to anthers than adnate and innate (p. 51). And the descriptions of certain plants given at the end of this little volume are far too meagre to be of much use, whilst to give a little pageful of 'useful products,' 16 all told, is doing either too little or too much.

The book is accurate on the whole, and is evidently written by a man acquainted with the subject. The author has read Sachs. The diagrams are of the good old type. A number of questions are given on the subject-matter of each chapter. But these kinds of questions are on the whole, we fear, useless. Students will not use them, and teachers ought to construct them for themselves.

Light, Heat, and Sound. By Annie Besant. London: 28, Stonecutter Street, E.C.

This treatise is clear, free from verbosity, and contains a judicious combination of reference to familiar phenomena, scientific explanation and demonstration by arithmetical or other formulæ. To most of the chapters useful examination questions are appended, by which the utility of the book will be greatly increased. We should prefer the illustrative diagrams to be printed with the text, whereby the trouble of turning back to two Photo-lithographed sheets would be avoided. The student will find modern scientific theories sufficiently alluded to in this manual without being unwisely discussed. As an illustration of this, we may quote the opening sentences on HEAT. 'Heat, like light, is a mode of motion, and heat and light cannot wholly be separated.' This is followed by experimental proofs of the statement, and is enough for the student who is not desirous of fully examining the proofs of the Correlation of Forces, nor the resolvability of a group of sciences into the results of Motion. Speaking of the fact of water boiling by less heat under less atmospheric pressure—about one degree for every 300 metres—'On high mountains, therefore, cooling becomes a matter of difficulty, as the water passes into steam before it is hot enough to cook meat.' In several passages the authoress honestly refers to the leading authorities—Deschanel on Heat, and Tyndall on Sound,—a praiseworthy habit in all scientific manuals.

An Easy System of Calisthenics and Drilling. By Thomas McCarthy. London: Allen and Co.

Physical exercises are now pretty well established in modern education. Their importance is felt in regard to healthy muscular development, which in regard to girls was too often confined to a formal walk and occasional lesson with the wand and rings. What a well-devised system of drill effects is shown by the conversion of the awkward and half-bent country lout into the smart soldier with his elastic yet firm step and erect bearing. To simplify the course of regimental drill, seems to be a desideratum for boys and girls' schools, and this the book before us carries out. Adequate directions are given in regard to the manner of performing the various movements, together with cautions against faults to be avoided. The drill and marching exercises are supplemented by those with the wand, light dumb-bells, and Indian club. The descriptions, of whose clearness we cannot complain, would be immensely improved by the addition of diagrams or descriptive figures.

A Practical Introduction to Greek Prose Composition. By Thomas Kerchever Arnold, M.A. New edition, edited and revised by Evelyn Abbott, M.A., LL.D. London: Rivingtons.

Two such sponsors for a book as Messrs. Arnold and Abbott must assure the world that their brain-child is everyway commendable. There cannot possibly be a better help to the young Grecian than this easy and exhaustive manual. In a day scarcely yet gone by, Greek grammars were the torment and abhorrence of schoolboys, dog Latin being the medium for explaining those more hieroglyphical secrets of the crabbed Greek, and to thousands beside the present writer, aorists, supines, and verbs in μι were in those years, ay, and still are, baffling and inscrutable mysteries. Now, however, by means of such an introduction as this, with its lucid order and its popular and easy explanations in our familiar Queen's English, the road to Parnassus is strewed rather with flowers than with flints, and all diligent scholars may go on their way rejoicing. Those terrible old grammars of Eton, Winton, and good King Edward may well be voted obsolete, while such pleasant substitutes as the book here noticed, usurp with all acceptance their ancient places in these fortunate modern times.

Lessons on Form. By Richard P. Wright. London: Longmans, Green and Co.

All geometricians are aware that the title of this book indicates a series of steps in the field that Euclid has developed into the grandest system of mental training yet known. But the term *form* would not be thus understood by a novice. To beginners, however, in the mathematics of form, such explanatory lessons as Mr. Wright here gives will be most valuable accompaniments to the study of Euclid, side by side with which it should be read. Taken by itself, Mr. Wright's book gives the substance or marrow of many of the results which Euclid develops by a regular series of steps that hang together and support one another like links of a chain. Such a rigid logical course Mr. Wright does not attempt, but his lessons are none the less valuable, and will greatly assist the student in rightly appreciating the nature of the geometrical field. As an example of the thoroughness of Mr. Wright's explanations, we may mention the lesson on ANGLES, with the number and character of each according to the points of intersection. A thorough knowledge of this chapter will form an excellent preparation to the study of triangles, with which Euclid begins. Mr. Wright's lesson (Chapter IV.) on TRIANGLES may be read beside the First Book of Euclid with great advantage, as showing the principal results aimed at, together with various ways of proving several propositions. The importance of Euclid's famous 47th Proposition (Book I.), generally known as the Theorem of Pythagoras, and on which a great deal of Mensuration and the whole superstructure of Trigonometry rests, will be well understood by Mr. Wright's clear and explanatory chapter, the 7th in his book, in which he lucidly shows the leading algebraical formulæ thence derived, together with the *rationale* for the main processes of Mensuration. Several methods of demonstrating the great theorem are given in addition to that by Euclid. The student will find himself in safe hands in mastering Mr. Wright's pages.

The Civil Service History of England. By F. A. White and H. A. Dobson. London: Crosby, Lockwood and Co.

This is not improperly called a fact-book of history, and is indeed crammed with a marvellous number of facts. The first half of the book comprises a summary of the usual historical details. The second half is made up of a series of appendices or special chapters on Constitutional History, Colonial and Indian History, British Biography, Literature, and Inventions and Discoveries. There may be some advantages in treating these latter-mentioned matters separately. We refrain from discussing the general value of these compendiums as short cuts to preparations for examinations. How far even memory is made certain by a firm impression being made by a complete picture instead of by a bare outline will depend very much upon the nature of the examination, as to whether a reasoning or deductive set of questions are set or those merely requiring the recapitulation of facts and dates. For the latter 'cramming' may be sufficient, but history is no more represented thereby than is a human being by a skeleton. The evils, however, belong more to the system than to this book, which is well enough of its class. Scarcely a word is uttered in common with the majority of made-up books on British history. The authors, instead of discarding, keep to the misleading term *Anglo-Saxon*. The authors sum up Stephen's character as 'warlike and cruel.' This phrase is not only badly written, but scarcely accurate. Stephen was more weak and yielding than cruel. He was indeed mild for the age, and his great fault seems to have been that of irresolution. Beckett is mentioned as 'Archdeacon of Canterbury,' which we are willing to regard as a slip for Archbishop. The author falls into the popular, erroneous expression, Joan of Arc, instead of Jeanne Darc. There is no place named Arc near Domremy, Jeanne's birthplace. The necessity for compression leads to a rather vague description of the National Debt. The second part of the book is more satisfactory. The constitutional part is thoroughly well done.

As India and the Colonies are treated each to an appendix we think such a Supplement is necessary to Ireland, and also to Scotland.

Engagements for March.

March 2.	Royal Society	4.30 p.m.
	Linnean Society	8 p.m.
,, 3.	Press Committee N.U.E.T.	
,, 4.	Leicester School Association Meeting	
	Bristol School Association Meeting	
,, 8.	Anthropological Society.	8 p.m.
	Geological Society	8 p.m.
,, 9.	Metrop. Board Teachers' Association. Committee Meeting	
	Royal Society	4.30 p.m.
,, 10.	Derbyshire District Union. Annual Meeting	
,, 13.	Royal Geographical Society	8.30 p.m.
,, 15.	Parliamentary and Law Comm. N.U.E.T.	
,, 16.	Royal Society	4.30 p.m.
	Linnean Society	8 p.m.
,, 17.	Executive N.U.E.T.	
	New Shakspere Society	8 p.m.
,, 18.	West Lancashire and Westmoreland District Union. Annual Meeting	
,, 22.	Geological Society	8 p.m.
	Anthropological Society	8 p.m.
,, 23.	Royal Society	4.30 p.m.
,, 24.	Browning Society. Rev. J. Kirkman, M.A.	8 p.m.
,, 27.	Royal Geographical Society	8.30 p.m.

ANSWERS TO ALGEBRA QUESTIONS IN 'THE SCHOLAR.'

(1) 15. (2) 30. (3) 3. (4) 5. (5) −12. (6) 24. (7) 78. (8) 13. (9) 2400. (10) −120. (11) $16\frac{1}{4}$. (12) $\frac{1}{12}$. (13) 24. (14) 8. (15) 84. (16) $\frac{a}{15}$. (17) $48\frac{1}{2}$. (18) −10. (19) $a+b$, $a-b$, ab, and $\frac{a}{b}$. (20) $240x$ pence. (21) $\frac{x}{y}$£ each. (22) $\frac{x}{2}$, $2x$, $x-y$.

ANSWERS TO ARITHMETICAL QUESTIONS IN 'THE SCHOLAR.'

STANDARD III.

A. 1. 189—7.
2. 202—11.
3. 2174—7.

B. 1. 2414—10.
2. 14,948—28.
3. 37,091—36.

C. 1. 8389—28.
2. £931 5s. 4½d.
3. £4374 3s. 10d.

D. 1. £642—15s.
2. 8479—430.
3. 248—1664.

E. 1. £1153 6s. 10½d.
2. £8516 17s. 10½d.
3. 1,030,554.

F. 1. 3,122,966 f.
2. £223 14s.
3. 21,734—843.

ADVANCED EXAMINATION

1. £596,431 0s. 3½d.
2. 1s. 1d.
3. £168 15s.

STANDARD IV.

A. 1. £879 16s. 1½d.
2. £44076 18s. 7½d.
3. £510 17s. 3½d.—6.

B. 1. £598,228 16s. 9d.
2. £289,115 12s. 6d.
3. 188,160 oz.

C. 1. 209 tons 5 cwt. 1 qr. 2 lb.
2. 588,060 sq. ft.
3. £1 2s. 6d.

D. 1. £425,766 19s. 7½d.
2. 12s. 0½d.
3. £428 19s. 0½d.—102

E. 1. 714 days 14 hrs. 25 mins 39 secs.
2. 486,600 secs.
3. £11 11s. 3½d.—2,694.

F. 1. 87 tons 4 cwt. 0 qrs. 12 lbs, 3 ozs. 2 drs.
2. 200,750 bricks.
3. 569,204 yds. 0 qr. 2 nls. 1½ ins.

ADVANCED EXAMINATION.

1. £16 17s. 6d. gain.
2. 4½ hours.
3. £487 10s.

STANDARD V.

A. 1. £8 10s. 0½d.
2. £22 8s. 0¾d.
3. £478 10s. 1½d.

B. 1. £166 2s. 1d.
2. £112 1s. 3d.
3. £1374 16s. 1½d.

C. 1. £8635 6s. 3d.
2. £16711 5s. 0½d.
3. £33779 12s. 8d.

D. 1. £87 0s. 9d.
2. £8 7s. 5¼d.
3. £331 8s. 6½d.

E. 1. £52 10s. 0½d.
2. £80 17s. 2½d.
3. £4 16s. 4$\frac{9}{17}$d.

F. 1. $31\frac{1}{4}$.
2. $3\frac{3}{4}$ days.
3. £1 17s. 4½d.

ADVANCED EXAMINATION.

1. £14,373 8s. 9d.
2. £3 10s., £7, £10 10s. and £21.
3. £149 0s. 1$\frac{3}{11}$d.

STANDARD VI.

A. 1. $2\frac{13}{24}$.
2. $1\frac{1}{16}$.
3. $\frac{84}{111}$.

B. 1. 71·9075.
2. 76·7.
3. ·159375.

C. 1. 200 shirts.
2. 20 days.
3. 189 ton.

D. 1. $25\frac{21}{128}$.
2. £28,586 13s. 4d.
3. $5\frac{77}{132}$.

E. 1. £32 1s. 9d.
2. £268 2s. 6$\frac{3}{25}$d.
3. 74·503606.

F. 1. $3\frac{1}{15}$.
2. $\frac{21}{44}$.
3. £23 2s. 10$\frac{3}{4}$d.

ADVANCED EXAMINATION.

1. $2\frac{33}{880}$.
2. 7s.—0·1957 2d.
3. 14,000 lbs.

STANDARD VII.

A. 1. 234.
2. £201 6s. $5\frac{1}{10}$d.
3. £365 5s. $7\frac{21}{241}$d.

B. 1. 11 years.
2. 4078.
3. 3 per cent.

C. 1. £1 18s. $4\frac{333}{1331}$d.
2. £357 2s. 10½d.
3. 23.

D. 1. $33\frac{1}{3}$, 25, 20 years.
2. $17\frac{17}{180}$ days.
3. £1600.

E. 1. ·0000171875.
2. £2075 18s. $9\frac{3}{11}$d.
3. $4\frac{1}{2}$ per cent.

F. 1. £548 16s. $10\frac{8}{11}$d.
2. £180.
3. 1,514,002 min.

ADVANCED EXAMINATION.

1. £2281 15s. $11\frac{7}{10}$d.
2. £3 8s. $4\frac{33}{41}$d.
3. 466·689, 155·563 yards.

COME, GENTLE SPRING.

Words by JAMES THOMSON. *Music by* T. CRAMPTON.

Andantino. mf

1st TREBLES.
2nd TREBLES.

1. Come, gen - tle spring, with all thy train, Un-loose cold win - ter's i - cy chain;
2. Come with your gen - tle vo - cal throng, That fill our woods with joy - ous song;
3. We long to hear the cuc - koo's cry, The soar-ing lark sing in the sky,

BASS.

KEY G. *Andante. mf*

1st TREBLE.
2nd TREBLE.
BASS.

p

And with thy life - re - vi - ving breath Wake Na - ture from the sleep of death.
Wa - ken a - gain the dor - mant bee, And clothe a - new the leaf - less tree:
Up - ri - sing high on tire - less wing, To wel - come back the joy - ous spring.

f D. t.

mf

Come, bring us sun - shine and fresh - 'ning showers, Stir - ring to life the
Come, clothe the mea - dows, now bleak and bare, With grass - es green and
Come with the prim - rose and fra - grant flowers, To deck a - gain our

f

f. G. *mf.*

p *legato.*

sleep - ing flowers! And to our hearts new plea - sure bring, With all the
dai - sies fair; The na - ked hedge - rows, brown and sere, Ar - ray in
wood - land bowers; And then a song of praise we'll sing, With grate - ful

legato. *f*

p

joys of beau - teous spring!
green - 'ry bright and clear.
hearts to thee, O spring.

Symph.

Symph. p

We beg to announce that any of the songs which have appeared in the back numbers of the PRACTICAL TEACHER may now be obtained separately, price 6d. per dozen, post free.

The Practical Teacher.

A MONTHLY EDUCATIONAL JOURNAL.

To Subscribers.—The *Practical Teacher* is published on the 25th of every month. Price 6d.; post free, 7½d.; sent post free, three months for 1s. 11d.; six months, 3s. 9d.; a year, 7s. 6d.

P. O. Orders should be made payable at Chief Office.

Subscribers not receiving their copies regularly are respectfully requested to write to the Publisher.

It would save time and expense if subscribers when remitting would state exactly what numbers they wish to be sent.

To Correspondents.—All literary communications should be addressed, THE EDITOR OF THE PRACTICAL TEACHER, Pilgrim Street, Ludgate Hill, London, E.C.

Accepted contributions are paid for within twenty-one days of publication.

The Editor cannot return rejected MSS.; authors should therefore retain copies.

TO ADVERTISERS.

Approved, *prepaid*, advertisements will be inserted in the *Practical Teacher* at the following rates:—

	s.	d.
20 words or under	3	0
Above 20 words and under 32 words ...	4	0
32 words and under 64 words	5	0
For every additional 10 words	1	0

Teachers Advertising for Situations.

	s.	d.
20 words or under	1	0
For every additional 10 words	0	6

For an ordinary page	4 guineas
For page facing matter	5 guineas.
For 2nd page of wrapper	5 guineas.
For 3rd page of wrapper	5 guineas.
For the page opposite the 3rd page of wrapper	5 guineas.
For the 4th (back) page of wrapper ...	6 guineas.

Parts of a page are charged at a slightly higher rate.—Special quotations will be given for a series.

☞ **Portfolios, fitted with elastic bands, for preserving twelve numbers of 'The Practical Teacher,' may now be had. Price 2s. 6d., post free.**

Nos. I. and II. of The *Practical Teacher* are now out of print.

Monthly Notes.

THE ARCHBISHOP OF YORK ON INDUSTRIAL SCHOOLS AND REFORMATORIES.—The new building of the York Certified Industrial Boys' School was opened by His Grace the Archbishop of York, president of the institution, on the 31st January. After the singing of a hymn, and prayer by the Rev. F. Lawrence, the chaplain, His Grace said that they were met that day on a very important business, to open three rooms in connection with the York Industrial School—the room in which they then were, and two others. It seemed to the committee that at present there was cause to be anxious about the future of industrial schools; and if they would pardon him for a minute, he would state what the causes of anxiety were. An industrial school, such as that, was a school for the waifs and strays of the population—those boys who were growing up in neglect, and with every prospect of ruin before them unless a helping hand was stretched out to them. But there were boys who had not yet come within the reach of the law for any criminal offence. A reformatory was quite a different thing. The child who had got for the first time into the hands of the magistrates, instead of being sent to a prison and so branded as a gaol-bird, was taken aside from the associations that surrounded him, and was shut up for a definite period in a reformatory school, in which he learnt some useful trade, and became, under proper management, a useful and excellent member of society. There was always expressed a warm wish and a constant intention to keep the industrial school apart from the reformatory, and for this very obvious reason. He could imagine nothing more cruel, more unjust, than to associate a boy whose only guilt was the misfortune of being poor, and being obliged to run about in the streets for want of a home to resort to, with those who had actually committed some crime. In the words of Sir Stafford Northcote in 1857, the matter was very well expressed:—'These children demand care and attention, not merely from motives of humanity, but from reasons of state policy connected with our criminal legislation; the difficulty of dealing with our criminals would be materially diminished if we could cut off the supply of those criminals at its source. These children not having committed crime, it would be unjust to associate them with those who had.' There the whole question lay in a nutshell. His Grace then referred to the state of poor children in the London districts, and said that their condition was too painful to think of. But there was one comfort—an institution like that. Why evil was allowed in the world, no one would ever tell; but one reason of its being allowed they might easily learn. Let them try to deal with it, try to do something to help it, then they would understand that it was to them a good—an incentive to noble exertions; and they felt they were doing a service to their great Master, Christ, because they were doing to His little ones what He would have done to them.

BEDFORD ASSOCIATION OF ELEMENTARY TEACHERS.—A meeting of the association in and around Bedford was held on Saturday, January 28th, in St. Mary's Schools, Bedford, under the presidency of Mr. Hall, of Ravenstone. There was a good attendance, the subject for discussion being the representation on the executive of schools in agricultural districts. On the motion of Mr. James, seconded by Mr. Hammond, it was unanimously resolved, 'That, in the opinion of this meeting, it is desirable that country districts should be more adequately represented on the executive, and that steps be now taken to secure that object.' Mr. Powell, of Northill, was then nominated, and a resolution passed pledging the associations there represented

to do all they can to secure his election on purely agricultural grounds. As a means of securing the co-operation of teachers throughout the country, it was decided to send letters to the educational papers, pointing out the great need of an agricultural representative, and asking the associations to support Mr. Powell with their votes at the conference to be held at Sheffield, in Easter.

THE BIRMINGHAM DISTRICT UNION.—The annual meeting of this union was held on the 16th February. The new president, Mr. Clark, after thanking them for the honour conferred on him, said that he would confine his remarks to that part of the proposals which referred to the administration of the grant. This was the supreme consideration both to managers and teachers, and was in so unsatisfactory a condition that he believed their whole efforts would have to be concentrated to put this on a satisfactory basis. He did not blame Mr. Mundella, who had done more than any previous statesman to earn the esteem and confidence of teachers and to prove his interest in the subject, for the monstrous proposition in art. 14 as to 100 per cent. for the maximum grant. Such an outrage on common sense could only have emanated from permanent officials removed from the ordinary experience and sympathies of human life. It betokened the most profound ignorance of the real bearings of this question. The president quoted figures from the *Times* to show that by the operation of the six months' clause 500,000 more children would be examined, and that this would probably bring down the average percentage to sixty-six. If schools favourably conditioned were taken into account, the great majority would therefore have hard work to earn a half of the maximum grant on the average attendance. And this was on the present high-pressure system, which teachers had fondly hoped was to be brought to an end, or at least modified. He argued strongly for the seventy-five per cent. demand which he believed under the proposals would be difficult to get, and which he thought would show very high results in the great majority of schools. Art. 14 would inflict great injustice not only on managers and boards, who were able to take care of themselves, but on teachers of schools in certain conditions. Forty per cent. might be better in some than ninety in others. The special merit grant could not possibly adjust the difference of grant in such cases, or if it could it would be a most powerful and dangerous weapon in the hands of any man, whether inspector, minister, or practical teacher. This article (14) he felt sure would prove a burden too heavy to be borne, and he believed that if teachers were unanimous and in earnest, their demands would be joyfully conceded before long, not only to their own satisfaction, but to the best interests of the children and the nation, and to the complete satisfaction of the department itself.

HACKNEY DISTRICT ASSOCIATION OF TEACHERS.—The annual Soirée of this flourishing Association took place on January 27th. Mr. Day—we beg his pardon, Captain Day—the President, did the honours of the evening. After light refreshment, dancing began about half-past eight, and was kept up till the small hours of the morning, to the lively strains of an efficient band. The evening's pleasure was also enhanced by the musical efforts of Miss Annie With, Mr. Needham, and Mr. T. Gardner. The last-named gentleman acted, with his usual courtesy, as M.C. Among the visitors we noticed Messieurs and Mesdames Heller, Devnish, Day, Tomlinson, Jeffries, Waugh, Gardiner, Filer, and Powel.

Gossip.

With this number we begin our second volume, and avail ourselves of this fitting opportunity of rendering our warmest thanks to the many friends all over the world who have interested themselves in the fortunes of our Journal. Its success, which dates from the first number, has, we are grateful to say, been permanent.

***

As it is our aim to make our magazine indispensable to every teacher, we are always glad to have suggestions from our readers. Some, however, must, we fear, be disappointed at our non-compliance with their requests. To such, we can only say, that our space is limited, and that if we had attempted to carry out half the 'special features' kindly sent us by correspondents we should have had to quadruple our pages. In making a selection, we try to choose those subjects of interest to the grestest number of our readers. We are sincerely sorry that we have not been able to print more articles bearing directly on the schoolmistresses' work. The requests have been so many, and still continue so urgent for these articles, that we have decided to issue on the 23rd of March a new ladies' educational monthly. No effort shall be spared to make it worthy the support of our fair friends. We need only further state here, that several of the first living educationalists, both men and women, have been engaged, and are now writing for the magazine, particulars of which will be duly announced in the educational weeklies.

***

Perhaps we may be pardoned for drawing attention to the little journal, *The Scholar*, which we present with our current issue. It is hoped, to use the old hackneyed phrase, that it will meet 'a long-felt want.' Teachers who adopt it in their schools, may rely that the contents will always be kept abreast of the Code.

***

Speaking of the Code and its requirements, reminds us that a few minutes ago we received a card of invitation to 'A Conference of Educational Publishers.' The subject for consideration may interest a large section of our Metropolitan teachers. It is 'the Requisition List of the London School Board.' The mere fact of the leading educational publishers of London meeting together to discuss such a subject, is evidence enough that there is something radically wrong in the framing of the above list.

***

It has always seemed to us little short of an insult to the London teachers that they are not permitted to use what books they deem most suitable for their scholars.

***

Further than this, it is no disrespect to the members of the School Management Committee to say that, with one exception—that of Mr. Heller, himself

till lately an elementary teacher—they are *not qualified* to make a selection of books for use in *elementary* schools.

***

The easiest solution of this question, which is as annoying to the worried teacher as to the luckless publisher, is this: The Board has already an account with every respectable publisher, therefore let the teacher be free to select what books he likes, not overstepping the average amount allowed for each child. Supposing, for argument's sake, that a bad selection was made; it needs no wiseacre to see that such a course would work its own cure in a very short time.

***

Then again, what an economy, not only in public money, but in the *time* of the members of the School Management Committee, would be effected. Surely the members, in their own interests and that of the ratepayers, should be willing to discontinue this farce. What would be said if we engaged the distinguished physician who sits at the Board, on the condition that in prescribing for us he should use certain medicines of our own choice! Such a proposition would be preposterous. In no walk of life other than that of the teacher's would it be tolerated.

***

Professor Stokes, of Cambridge, has accepted the appointment of Burnett Lecturer in connection with Aberdeen. He will hold the appointment three years, if he delivers a course of lectures at Aberdeen upon 'recent researches in physical science, with special reference to natural religion.' These are the new regulations of the Burnett trust, and the lectures have been instituted in place of the Burnett Prizes which were awarded every forty years. The prize in 1855 was won by Principal Tulloch, and that of 1815 by Archbishop Sumner.

***

Mr. E. Nicholson, Librarian of the London Institution, has been appointed by the curators to be librarian of the Bodleian, vacant by the death of Mr. Coxe. It is understood that Mr. Nicholson possesses excellent qualifications for the office as respects practical knowledge and experience.

***

We hear that Blackwood's Diaries have this year met with unusual success. The sales have been between one and two hundred thousand, and the public have had the choice of buying them at prices varying from one penny to twelve shillings.

***

Mr. Oscar Wilde, the 'apostle of culture,' and the 'Postlethwaite' of *Punch*, seems to be creating a great sensation across the water. He was not satisfied with his little trip over the Atlantic, and he doesn't seem to think much of Niagara, judging by his note in the memorandum book of the hotel at that place. He says, 'the roar of the waters is like the roar when the mighty wave of democracy beats upon the shore where kings lie crouched at ease.' We never heard the roar of the democratic waves, and we never knew a king who enjoyed easy times. Our own Prince of Wales does as much work as any common labourer, and so do most other sovereigns. Mr. Wilde is evidently growing confused with the incense of adulation showered upon him by the American public.

***

We hear that Mr. Henry Irving has been elected a member of the Athenæum, under a rule which allows the members of that club to select annually some person distinguished in art, science, or literature for honorary membership.

***

A very ancient British kist-vaen has been found in Kent by the Rev. F. Vine, who will shortly publish an account of it in his archæological work entitled 'Cæsar in Kent.'

***

We hear that Mr. H. Sweet has finished his shorter Anglo-Saxon reader, which will be published in the Clarendon Press Series very shortly. The work is intended to form an introduction to a longer work.

***

Mr. J. A. Symonds is engaged in printing a collection of one hundred and fifty original sonnets. Five of these only have been before published, three in Mr. Hall Caine's recent collection of sonnets, and two in *Cornhill*. The volume will be entitled *Vagabunduli Libellus*.

***

Messrs. Hurst and Blackett announce a new work by the author of *John Halifax*, entitled *Plain Speaking*.

***

Messrs. Sotheby's recent sale of autographs included some important documents in the handwriting of Garrick, John Locke, Burns, Nelson, Edgar A. Poe, and a volume of comedy memoranda by Sheridan. There are also rough draughts in Moore's handwriting of *Lalla Rookh*, the *Life of Byron*, the *Epicurean*, and two of the same writer's commonplace books.

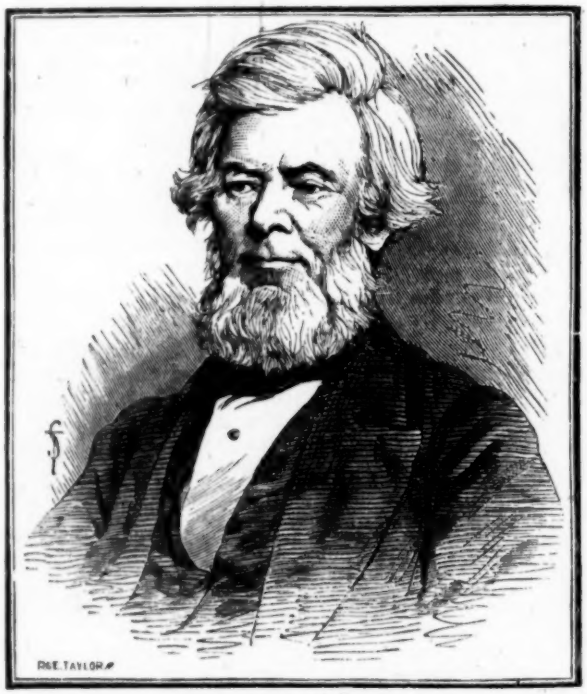
SCHOOL DESK FOR ARMY SCHOOLS AND MISSION ROOMS.—A new school desk, of novel and ingenious construction, combining strength, simplicity of movement, and suitability for both children and adults, has been constructed by Mr. Thomas Laurie, 31, Paternoster Row. After being carefully examined and tested by every department of the War Office, it has been formally sanctioned and adopted by Her Majesty's Government for use in Army schools and mission rooms.

We regret to state that an unfortunate error was made in the wording of Mr. G. E. Hawes' advertisement which appeared in our last issue. Mr. Hawes' Desks should have been described, not as the 'Eastern Counties,' the 'Collegiate,' the 'County,' etc., but as the 'Norwich' Desks.

William Chambers, LL.D.

'THE hoary head is a crown of glory, if it be found in the way of righteousness.' So wrote the inspired penman—the wisest of men. We need no better example illustrative of the above sacred truth than the life of William Chambers, whose portrait and autograph we have (through the ready courtesy of some of his Edinburgh friends) the pleasure to present to our readers.

All the world knows that the jubilee year of 'Chambers's Journal' has just been signalized by the appearance of 'Reminiscences of a Long and Busy Life' in that popular periodical. Upon reading this remarkably interesting and profitable *résumé* of a life's work, it occurred to us that as the fortunes of the house of Chambers had been so closely identified with *educational* literature, and that as few indeed must be the schools in which some at least of their many excellent publications are not used, it would be a fit thing to give in our pages a sketch of the early career of the founder of this eminent firm, whose name has long since become a household word.



Yours truly
W. Chambers

In so doing we shall, of course, have to draw largely upon the 'Reminiscences' themselves for our information. To few men is it given to write as follows:—

'I think, however, that I am fairly entitled to feel gratified at the singular success of a work which, relying on the support of no party or sect, nor on any species of artistic attraction, should have so long kept its ground, and that now, after a lapse of fifty years, should, judging by circulation, be more popular than it was in the early stages of its career. There is more than this literary and commercial success to be thankful for. It is that the hand which penned the Introductory article in the first number of the Journal in 1832 has been spared to write the present address.'

William Chambers was born in 1800, his oldest distinct recollection being the rejoicings consequent on the triumph of Nelson at the Battle of Trafalgar, October 21st, 1805. Here is the story of his early education:—

'I was not fated to receive more than a plain education in the place of my birth, a small country town in the south of Scotland. Matters there were still somewhat primitive. In the schools I passed through there was not a map, nor a book on geography, or history, or science. The only instruction consisted of the three R's, finishing off with a dose of Latin. I was a simple and cheap arrangement, diversified with boisterous outdoor exercises, and a certain amount of fighting, in which I was forced to take a part. My instruction in Latin came abruptly to a conclusion. Lieutenant Waters, in one of his old novels, says, with more energy than eloquence, that he still bore the marks of "Homo" on his person. I likewise have the honour of bearing similar evidences of my acquaintance with Homo. One day, not being quite prompt in answering a question in Latin grammar, my teacher, in one of his irascible moods (which were always distinguishable by his wearing a short bottle-green coat), lifted a ruler and inflicted a sharp blow on the top of my head, which almost deprived me of consciousness, and which, while leaving a small protuberance, is on occasions, after an interval of seventy years, still felt to

be awkwardly painful. So much for my acquaintance with Homo. With every respect for his agency in mental culture, I shortly afterwards bade the academy good-bye; and so ended my classical education or school education of any kind.'

Lacking as was his school education, we think the doctor was singularly fortunate in that sterner education which comes of having to do battle with life's difficulties. In any business or profession, William Chambers would have made his mark. One has only to look at the firm set mouth, and general contour of the head, for evidence of those qualities which, when used with ordinary discretion, give the Scotchman such vantage in the world's strife. So keen was his thirst for knowledge, that every spare hour was given up to reading, and we are told that he even sold his pet rabbits to buy books.

In May, 1814, he was apprenticed for five years to a bookseller, a strict disciplinarian, who forbade his reading. But the young student was not thus to be easily baulked; he made the acquaintance of a baker of literary tastes, and as early as five in the morning would repair to his bakehouse to read passages from Smollett and Fielding, his reward for this work being,—a hot roll.

As we read the story of these early struggles, we cannot help recalling the somewhat similar experience of Dr. Franklin, and more recently those of Michael Faraday. At this time young Chambers managed to live in lodgings and pay his way on four shillings per week. In recounting this part of his history he says, 'It was a hard but somewhat droll scrimmage with semi-starvation; for as concerns food it was an attempt to live on threepence halfpenny a-day. Yet it was done.'

There is something noble, manly, refreshing, and soul-inspiring in that '*Yet it was done.*'

Is not the bold, self-reliant, and persevering spirit which could dictate such a sentence the true philosopher's stone? To their mother, a woman of singular nerve and resolution, William and Robert, her two sons, owed much. Her advice and example were priceless, 'Aye haud forrit,' was the excellent motto she bade them adopt. At the close of his apprenticeship William had just a crown, and with this sum he began life for himself. To quote his own words: 'I was fortunate in the moment when I was thrown on my own resources. A London bookseller, who had come to conduct a trade-sale in Edinburgh, sought my assistance to arrange his specimens. I willingly lent my aid; and this worthy person, understanding that I wanted to begin business, but only had five shillings of capital, gave me an excellent selection of books on credit to the value of ten pounds. Borrowing a truck for the occasion, I wheeled the books to a small place of business I had secured in Leith Walk, and there I exhibited my stock of books on a stall, which I constructed of wood bought with the five shillings. Again fortune proved favourable. The books were speedily disposed of, and a fresh stock was ordered. A good start had been made. After discharging all my obligations, I had a few pounds over, and by following a rigorous system of thrift, things were decidedly looking up.'

William was bound to get on, as his ready resource never failed him. In wet weather he had plenty spare time. This he turned to good account by copying small pieces of poetry with a crow pen. But better things were in store for him. With an odd three pounds he bought a stock of worn types, cut headlines in wood with his penknife, and thus set up as a printer.

'I actually with these poor appliances began the business of a printer, in addition to my small bookseller's concern. After a little time, overcoming every difficulty, I managed to execute an edition, small size, of the songs of Robert Burns, with my own hands bound the copies in boards with a coloured wrapper, sold the whole off, and cleared eight pounds by the transaction.'

In the autumn of 1821 the two brothers issued a fortnightly, entitled, 'The Kaleidoscope.' This paper had but a brief life, as only eight numbers were published.

For some time after, the elder brother stuck to his printing and bookselling.

Years later, with the establishment of 'The Society for the Diffusion of Useful Knowledge,' 'Schools of Art,' and 'mechanics institutes,' there sprang into existence numbers of cheap periodicals for the people.

'Here,' said I, pondering on the subject, 'is my chance.' He saw the tide rising, and with that decision of character which seems inseparable from all successful men, took it at its flood, and it led him on to fortune.

On February 4th, 1832, the first number of CHAMBERS'S JOURNAL was issued. From the very first it leaped into an immense circulation, and has ever since been growing in favour with that vast constituency for whom it was primarily projected. When the fourteenth number was issued, the younger brother was admitted a partner, and thus was established the firm of W. and R. Chambers. Of the subsequent career of this eminent house it is needless for us to speak. To those, however, who would like to continue the story penned by a loving hand, we say, get the February number of the Journal itself. It will thoroughly well repay a perusal. Honours thick and fast have fallen upon the venerable doctor. And in the name of our twelve thousand readers we congratulate him, and most sincerely wish him light at eventide. 'Seest thou a man diligent in his business? he shall stand before kings.'

JOSEPH HUGHES.

The 'Practical Teacher' Letter Competition.

AWARD OF PRIZE.

(*The Prize has already been paid.*)

JUDGE'S REPORT.

Of the ninety letters received two were reported as disqualified. The writers of remaining eighty-eight not only show a knowledge of the special needs of a young pupil teacher, but, without exception, manifest a kindly sympathy with his position, and encourage him by their own experience as well as by considerations which could not fail to impress his mind with the importance and imperishable character of the work upon which he was about to enter. I cannot avoid stating that the nobility and responsibility of the teacher's vocation is so represented as to stimulate the development of the highest faculties, and from the highest motives. The prize is awarded to 'Hope'; but *proximè accesserunt* 'Uncle George,' 'Daisy Experimento,' and 'St. Botolph,' etc. Nearly one-half of the candidates are ladies, and judging from internal evidence two of the writers just named are

head-mistresses. The high tone of all the letters has made their perusal a positive pleasure.

JOHN R. LANGLER, B.A., F.R.G.S.,
President of the National Union of Elementary Teachers.

The prize (five guineas) in accordance with the above report, is awarded to Hope, (Frederick J. Gould, 1, Minson Road, Victoria Park Road, E.)

Other Competitors.

Nil Desperandum, Asbestos, Minnie, Earnest, An Englishwoman, Mothcol, Effie Howard, Selim, A Scholar in the School of Life, Faith, Experience, Dandelion, Edith, Practical Teacher Minnie, Guppu, Aspirant, Dawson Brooks, A Believer in Education, not in Cram, Der Mutz, Mary Stuart, Tortoise, Uncle George, Snowdrop, N. R. G., Leylam, Daisy Experimento, A. B. H., Keziah, Lesena, Pseudonym I., Lily Nesby, Thistle, Dominie Sampson, Mountain Heather, Marie Rose, Ivythorn, Fort pour Dieu, Charlotte E. Dalton, Sirdar Khan Sing, S. Moore, Peterkin, Pseudonym II., Wild Honeysuckle, Norfolk, L. H., Neophyte, Nil Desperandum II., Index, Teesdale Daisy, Erudio, Marian May, Mayhew Speedwell, Excelsior, Help, Burnside, Excelsior II., Nisi Dominus Frustra, Lælius, Pilot, Willie Winter, Maya, Sir John Long, Zoë, Amicus, Marguerite, Madelaine, Springtime, Silverpen, Wonrad XVIII., Edith Mary Vivian, A Long Fellow, not Longfellow, Rus in Urbe, et in Rure Urbs, Veritas, Electric System, Patricia, Agricola, Mentor, Principiis Obsta, Polonius, A. E. G., Janus, Josephus Tapson, Perseverance, St. Botolph, One who loves Teaching, Labore et Constantia, Violet, and Irene.

Disqualified.

One of the Profession, and Adventura.

—o—

The 'Practical Teacher' Drawing Competition.

AWARD OF PRIZES.

(*The prizes have already been paid.*)

FIRST YEAR—MALES.

The prize, seven shillings and sixpence, has in this division been awarded to

STRONGBOW.

Russell Venables, Rossett National Schools, Wrexham.

Other competitors:—Snowdrop, Rollo, Nil Desperandum, Brutus, Navigator, Venta Belgarum, Nemo, Pupil Teacher, Nitor in Adversum, Alfred.

FIRST YEAR—FEMALES.

The prize, seven shillings and sixpence, has in this division been awarded to

TITANIA.

Rachel Marks, 375, Kingsland Road, London.

Other competitors:—Belper, Effie, E. Room.

SECOND YEAR—MALES.

The prize, ten shillings, has in this division been awarded to

HARRY.

J. H. H. Jarrett, 5, Bridge Street, Bridgnorth.

Other competitors:—Ivanhoe, Welsh Artist, Pop, P. M., Fair Play, Mistletoe, Zeno, Scio, Boy's Own.

SECOND YEAR—FEMALES.

The prize, ten shillings, has in this division been awarded to

CINDERELLA.

Fanny R. King, Great Berkhampstead Board School.

Other competitor:—Violet.

THIRD YEAR—MALES.

The prize, fifteen shillings, has in this division been awarded to

BREDON.

Fredk. H. Lees, 129 Newbridge Lane, Stockport.

Other competitors:—A Novice, Adolphus, Waverley, Bend Or, M. N. O. P., Nicholas Nickleby, Capt. Hedley Vicars, Edrude, Spes, Caractacus, Julius Cæsar, Euclid, Mani tien le Droit, Esrom, Tableau, X. Y. Z., St. Augustine, Discipulus, Traho, Iroquois.

THIRD YEAR—FEMALES.

No competitors.

FOURTH YEAR—MALES.

The prize, one pound, has in this division been awarded to

IMPERITUS.

William T. Stone, 17, Spring Cottages, Banbury.

Other competitors:—Caius, Mushroom, Hyacinth, Excelsior, Teacher V., Dominica, Euphonia, Augereua, Patriot, Dewi Saut, George Lee.

FOURTH YEAR—FEMALES.

The prize, one pound, has in this division been awarded to

DO WELL.

Mary Ann Kinsey, Pontnewynydd, Pontypool.

Other competitors:—Self-taught, Eschscholtzia.

DISQUALIFIED.

Anglo-Roman.

—o—

Publications Received.

Acoustics—
(1) Besant's Light, Heat, and Sound. 28, Stonecutter Street.

Algebra—
(1) MacKean's Algebra for Students. T. Nelson and Sons.

Analysis—
(1) Stoker's Analysis and Composition. W. Stewart and Co.

Arithmetic—
(1) Driver's Aid to Arithmetic. Griffith and Farran.

English Literature—
(1) Morrison's Byron's Childe Harold's Pilgrimage. Canto IV. Gall and Inglis.

Geography—
(1) Lord's Modern Europe. Simpkin, Marshall & Co.

Gymnastics—
(1) McCarthy's Easy System of Calisthenics. W. H. Allen and Co.

Kindergarten—
(1) Steele's Kindergarten Handbook. W. Stewart and Co.

Latin—
(1) Bell's Grammar School Classics. G. Bell and Son.

Miscellaneous—
(1) Fothergill's The Food we Eat. Griffith and Farran.

Music—
(1) Curwen's How to Read Music. Tonic Sol Fa Agency.

Periodical Literature—
(1) Ward and Lock's Universal Instructor. XVI. Ward, Lock and Co.
(2) Our Little Ones. IV. Griffith and Farran.

Reading Books—
(1) Jarrold's Empire Readers. Jarrold and Son.

Science—
(1) Shanton's Preparation for Science Teaching. Griffith and Farran.
(2) Danver's Science Ladders. Sampson Low and Co.

Query Column.

☞ As the answer to a single question often entails an expense six or seven times greater than the cost of the complete key to any of the Arithmetics or Algebras ordinarily used, the Proprietor of this Journal would be glad if students confined themselves to questions, the full working of which is not published in the form of a 'key.'

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents who send numerical or algebraical questions for solution, and are able from any source to give the required answer, would do so. It would save much time at present spent on verification.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. Replies will not be sent through the post.

4. Correspondents are requested to write *legibly*, and on one side of the paper only.

5. Correspondents wishing us to recommend books for any (other than the ordinary Government) Examinations, or to answer any questions concerning that Examination, must, in all cases, send a copy of Regulations up to date.

6. Queries must reach the office *not later than the 15th of the month*, or they cannot be attended to in the following issue.

7. All queries in future must have a pseudonym, and must be written on a slip of paper other than that which bears the real name and address of the sender.

*** All communications for this column should be addressed

'The Query Editor,'
The Practical Teacher
Pilgrim Street, Ludgate Hill,
London, E.C.

Arithmetic.

1. R. B.—Simplify $\dfrac{2\times\sqrt{1+\frac{1}{3}}\div\sqrt{1-\frac{1}{3}}}{5\times\sqrt{1+\frac{1}{3}}\times\sqrt{1-\frac{1}{3}}}$.

$$\frac{2\times\sqrt{1+\frac{1}{3}}\div\sqrt{1-\frac{1}{3}}}{5\times\sqrt{1+\frac{1}{3}}\times\sqrt{1-\frac{1}{3}}}$$

$$=\frac{2\times\sqrt{\frac{4}{3}}\div\sqrt{\frac{2}{3}}}{5\times\sqrt{\frac{4}{3}}\times\sqrt{\frac{2}{3}}}$$

$$=\frac{2\times\sqrt{\frac{4}{3}\times\frac{3}{2}}}{5\times\sqrt{\frac{8}{9}}}$$

$$=\frac{2}{5}\times\sqrt{\frac{2}{\frac{16}{18}}}$$

$$=\frac{2}{5}\times\sqrt{\frac{18}{16}}$$

$$=\frac{2}{5}\times\frac{3}{4}$$

$$=\frac{3}{10}.$$ Ans.

2. YELSERP.—A person buys 1000 qrs. of wheat at 54s. per quarter; he keeps it 7 months, during which time it loses in quantity 2½ per cent.; if money be worth 5 per cent. and his incidental expenses be £20, what does he gain or lose by selling the wheat at 58s. a quarter? (*Barnard Smith.*)

Cost of wheat = 54s. × 1000
= £2700

Interest on investment = $\frac{7}{12}$ of 5% on £2700
= $\frac{7}{12}$ of £135
= £78 15s.

Quantity of wheat remaining = (100 − 2½)% of 1000 qrs.
= 97½% of 1000 qrs.
= 975 qrs.

Selling price of wheat = 58s. × 975
= £2827 10s.

∴ Gain = £2827 10s. − (£2700 + £78 15s. + £20)
= £2827 10s. − £2798 15s.
= £28 15s. Ans.

3. SUSSEX.—If the increase in the number of male and female criminals be 1·8 per cent., while the decrease in the number of males alone is 4·6 per cent., and the increase in the number of females is 9·8 per cent., compare the number of male and female criminals respectively. (*Barnard Smith.*)

(No. of male and female criminals) × $\frac{1\cdot8}{100}$ = No. of female criminals × $\frac{9\cdot8}{100}$ − No. of male criminals × $\frac{4\cdot6}{100}$.

(No. of male and female criminals) × 1·8 = No. of female criminals × 9·8 − No. of male criminals × 4·6.

No. of male criminals × 1·8 + No. of female criminals × 1·8 = No. of female criminals × 9·8 − No. of male criminals × 4·6.

No. of male criminals × 1·8 + No. of male criminals × 4·6 = No. of female criminals × 9·8 − No. of female criminals × 1·8.

No. of male criminals × 6·4 = No. of female criminals × 8.

$$\frac{\text{No. of male criminals}}{\text{No. of female criminals}}=\frac{8}{6\cdot4}.$$

∴ No. of male criminals : No. of female criminals.
:: 8 : 6·4
:: 80 : 64
:: 5 : 4. Ans.

4. LITTLE DORRITT.—A person buys 50 reams of paper, which he thought to sell at £1 2s. 6d. per ream, making 8 per cent. profit on the prime cost; but five reams being damaged, what did he gain or lose per cent. by selling the remainder at the same rate? (*Todhunter.*)

Prime cost per ream = £1 2s. 6d. × $\frac{100}{108}$;
„ „ of 50 reams = £1 2s. 6d. × $\frac{100\times50}{108}$

$$=\left(\frac{9}{8}\times\frac{25\times\cancel{50}}{\cancel{27}}\right)£$$

$$=\frac{\frac{225}{4}}{3}£$$

$$=\frac{225}{12}£$$

= £52 1s. 8d.

Selling price of 45 reams = £1 2s. 6d. × 45
= £50 12s. 6d.

Loss = £52 1s. 8d. − £50 12s. 6d.
= £1 9s. 2d.

£ s. d. £ £ s. d.
∴ 52 1 8 : 100 :: 1 9 2 : Loss %
20 20
1041 29
12 12
12500 3480
5 14
= 2½% loss. Ans.

5. FIDUS ACHATES.—At what rate per cent. will the discount on £1336 11s. 3d., due at the end of 3½ years, amount to £199 1s. 3d.? (*Evers.*)

Present worth = £1336 11s. 3d. − £199 1s. 3d.
= £1137 10s.

£ £
1137½ : 100
∴ yrs. yrs. :: 199 1/16 : Rate %
3½ : 1
16
1195
199
3185
5

$$= \frac{2 \cdot 3185 \times 1 \times 100}{2275 \times 7 \times 1} \pounds$$

= 5%. Ans.

6. URSULA.—Simplify

$$\tfrac{3}{5}(6\tfrac{2}{3}+2\tfrac{1}{2})\pounds + \left(\frac{2\tfrac{1}{2}-\tfrac{3}{5}\text{ of }1\tfrac{5}{6}}{\tfrac{1}{2}\text{ of }3\tfrac{1}{2}+\tfrac{1}{2}\tfrac{1}{3}} \times \text{'95 of 5s.}\right) + \frac{16{\cdot}8}{\text{'024}}\text{d.}$$

$$\tfrac{3}{5}(6\tfrac{2}{3}+2\tfrac{1}{2})\pounds + \left(\frac{2\tfrac{1}{2}-\tfrac{3}{5}\text{ of }1\tfrac{5}{6}}{\tfrac{1}{2}\text{ of }3\tfrac{1}{2}+\tfrac{1}{2}\tfrac{1}{3}} \times \text{'95 of 5s.}\right) + \frac{16{\cdot}8}{\text{'024}}\text{d.}$$

$$= \tfrac{3}{5}\left(\tfrac{20}{3}+\tfrac{5}{2}\right)\pounds + \left(\frac{\frac{2}{1}-\frac{1}{3}\text{ of }\frac{11}{6}3}{\frac{1}{4}\text{ of }\frac{16}{3}2+\frac{13}{36}} \times \tfrac{1}{20}\text{ of }5\text{s.}\right) + 700\text{d.}$$

$$= \tfrac{3}{5}\left(\frac{40+15}{6}\right)\pounds + \left(\frac{\frac{3}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{13}} \times \tfrac{1}{4}^{0}\right)\text{s.} + 700\text{d.}$$

$$= \left(\frac{11}{3}\text{ of }\frac{55}{6}\right)\pounds + \left(\frac{81-44}{\frac{24+13}{36}} \times \tfrac{1}{4}^{0}\right)\text{s.} + 700\text{d.}$$

$$= 1\tfrac{1}{3}\pounds + \left(\frac{37}{37} \times \tfrac{1}{4}^{0}\right)\text{s.} + 700\text{d.}$$

= £3 13s. 4d. + 4s. 9d. + £2 18s. 4d.
= £6 16s 5d. Ans.

7. JACQUES.—A hare starts 40 yards before a greyhound and is not seen by him till she has been up 30 seconds. The hare runs at the rate of 12 and the hound at the rate of 15 miles per hour. How long will the chase last, and what distance will the hound have run? (*Brooke Smith.*)

Distance run by hare before she is seen by hound
$= \frac{30}{60 \times 60}$ of 12 miles
$= \frac{1}{120}$ mile
= 176 yards.

∴ The hare is (176 + 40) or 216 yards before hound.
The hound gains three miles in an hour;

∴ The chase lasts $\frac{216}{3 \times 1760}$ of an hour
$= (\frac{9}{220}$ of $\frac{60}{1})$ min.
$= \frac{27}{11}$ min.
= 2 min. $27\frac{5}{11}$ sec.

∴ Distance run by hound $= (\frac{9}{220} \times 15 \times 1760)$ yds.
= 1080 yards. Ans.

8. T. W., Oswestry.—I bought 100 cards for 9s. 2d., and sold the lot so as to gain ⅛ of the selling price. Find the selling price and my gain per cent.

Selling price = cost price + ⅛ of selling price
⅞ Selling price = cost price
∴ Selling price = ⅛ cost price
= ⅛ of 9s. 2d.

$$= \left(\frac{4}{8}\text{ of }\frac{11}{88}\right)\text{s.}$$

$$= \frac{3}{6}$$

= 14s. 8d.

s. d. £ s. d.
∴ 9 2 : 10 :: 5 6 : gain %.
12 12
110 60
6
= 60% gain. Ans.

9. SUBSCRIBER.—A beats B 3 yards in a race of 300; C can beat B 9⅓ yards in same distance; by how much should C beat A in a mile race?

A runs 300 yds. while B runs 297 yds.,
and C " " " " " " 290⅔ "
yds. yds. yds.
∴ 297 : 290⅔ :: 880 : Distance run by A while
11 4 75 C runs 300 yds.
1100
43
$= \frac{3200}{11}$ yds. $= 293\frac{9}{11}$ yds.
yds.
300
yds. yds. $293\frac{9}{11}$
∴ 300 : 1760 :: $6\frac{2}{11}$: Distance C should beat A in a mile.
40

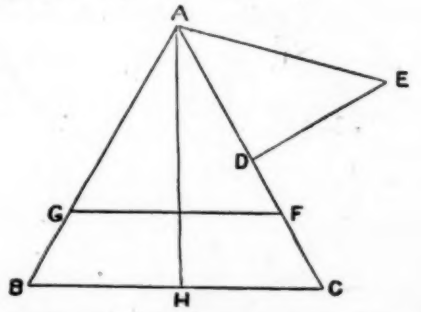
$$= \frac{160 \times 7}{880 \times 11}\text{ yds.}$$

4
= 40 yards. Ans.

Geometry.

1. NORMAN.—Bisect an equilateral triangle by a line drawn parallel to the base, using only *first* book of Euclid.

Let ABC be the equilateral triangle.



Construction.—Bisect AC in D, and at D draw DE at right angles to AC, and equal to AD. Join AE, and from AC cut off AF, equal to AE. Through F draw FG parallel to BC.

Then GF shall bisect the equilateral triangle ABC. Draw AH perpendicular to BC.

Proof.—Area of triangle ABC = the rect. AH, HC (I. 41). Now AC = 2 HC.

If, therefore, AC contains m units, HC will contain $\frac{m}{2}$ units, and if AH contain x units,

$$x^2 + \left(\frac{m}{2}\right)^2 = m^2 \text{ (I. 47)},$$

$$x^2 + \frac{m^2}{4} = m^2, \therefore x^2 = m^2 - \frac{m^2}{4} = \frac{3m^2}{4};$$

$$\therefore x = \frac{m}{2}\sqrt{3}.$$

$\therefore$ area of triangle ABC $= \frac{m}{2} \times \frac{m}{2}\sqrt{3}$

$= \frac{m^2}{4}\sqrt{3} = \frac{\sqrt{3}}{4}\, m^2.$

In like manner, the area of triangle AGF, which is also an equilateral triangle $= \frac{\sqrt{3}}{4} \times AF^2.$

But $AF^2 = AE^2 = AD^2 + DE^2$ (I. 47) $= 2\,AD^2.$

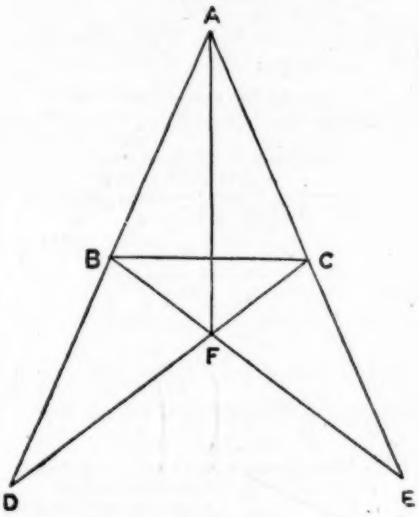
$= 2 \times \left(\frac{m}{2}\right)^2 = \frac{m^2}{2}.$

$\therefore$ area of AGF is half of area of ABC.

Wherefore the straight line GF drawn parallel to BC bisects the equilateral triangle ABC.—Q.E.F.

Note.—The general method of bisecting a triangle by a line drawn parallel to one of the sides is given in last issue, but the proof depends on the *sixth* book of Euclid.

2. S.T.H.—Prop. V. AB = BD, AC = CE. Join BE, CD. Prove DF = twice FC, or EF = ,, FB. Join AF.



Proof.—$\triangle$ BFD = $\triangle$ AFB (I. 38).

$\therefore$ twice $\triangle$ BFD = twice $\triangle$ AFB

= $\triangle$ ABC + $\triangle$ FBC;

And $\triangle$ ABC = $\triangle$ BCD (I. 38).

= $\triangle$ BFD + $\triangle$ FBC;

$\therefore$ twice $\triangle$ BFD = $\triangle$ BFD + twice $\triangle$ FBC,

$\therefore$ $\triangle$ BFD = twice $\triangle$ FBC (Ax. 3).

These triangles are between the same parallels.

$\therefore$ base DF = twice base FC.—Q.E.D.

Mensuration.

1. J. HOLLOWAY, Tring.—A cask, weighing 2 cwt. 12 lb. 4 oz., floats in a cubical cistern of water, whose side is 5 ft.; on the removal of the cask, find how much the water will sink in the cistern, supposing a cubic foot of water to weigh 63 lbs.

Quantity of water displaced $= \frac{2 \text{ cwt. } 12 \text{ lbs. } 4 \text{ oz.}}{63 \text{ lbs.}}$ cub. ft.

$= \frac{236\frac{1}{4}}{63}$ cub. ft.

$= \frac{1025}{252}$,,

$= \frac{175}{36}$,,

Surface of cistern = 25 sq. ft.

$\therefore$ the water will sink $(\frac{175}{36} \div 25)$ ft.

$= \frac{7}{36}$ ft.

$= \frac{7}{3}$ in.

$= 2\frac{1}{3}$ in.

Algebra.

1. N. H. B.—Prove that $\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$.

Let $\frac{a}{b} \div \frac{c}{d} = x$; then $\frac{a}{b} = x \times \frac{c}{d} = \frac{xc}{d}$;

$\therefore \frac{ad}{b} = xc$, and $\frac{ad}{bc} = x.$

$\therefore \frac{a}{b} \div \frac{c}{d} = \underline{\frac{ad}{bc}}.$

2. D. TURNER.—Suppose the distance between London and Edinburgh is 360 miles, and that one traveller starts from Edinburgh and travels at the rate of 10 miles an hour, while another starts at the same time from London, and travels at the rate of 8 miles an hour; it is required to know where they will meet. (Solution by Algebra.)

Let x = time when they meet in hours;

Then $10x$ = distance gone by traveller from Edinburgh in miles,

And $8x$ = ,, ,, ,, ,, ,, London ,, ,,

$\therefore 10x + 8x = 360$

$18x = 360$

$\therefore x = 20.$

$\therefore$ Distance from Edinburgh = (10×20) miles.

= 200 miles.

3. G. HUGHES, Pembroke.—A certain number consists of two digits, and if the sum of the digits be added to $\frac{9}{16}$ of the number, the digits will have exchanged places. By what fraction of the number must the difference of the digits be multiplied that the result may be their product? (*Colenso.*)

Let x = digit in ten's place,

And y = ,, ,, unit's ,, ;

Then $10x+y$ = the No.

$\therefore x+y + \frac{9}{16}$ of $(10x+y) = 10y+x$

$\frac{9}{16}$ of $(10x+y) = 9y$

$\frac{1}{16}$ of $(10x+y) = y$

$10x+y = 16y$

$10x = 15y$

$2x = 3y$

$\therefore y = \underline{\frac{2x}{3}}.$

$$\text{Multiplier} = \frac{xy}{x-y} = \frac{x \times \frac{2x}{3}}{x - \frac{2x}{3}} = \frac{\frac{2x^2}{3}}{\frac{x}{3}} = \underline{2x}.$$

$$\therefore \text{Fraction of No.} = \frac{2x}{10x+y} = \frac{2x}{10x + \frac{2x}{3}}$$

$$= \frac{6x}{32x} = \underline{\frac{3}{16}} \text{ Ans.}$$

4. W. H. S.—Find G.C.M. of $x^3+a^2x^2$ and $x^3+x^2y+xy^2$.

$x^3+a^2x^2 = x^2(x+a^2).$

$x^3+x^2y+xy^2 = x(x^2+xy+y^2).$

$\therefore$ G.C.M. = $\underline{x}$.

5. NERO, Pontypridd.—Prove that:—

$x^4+px^3+qx^2+rx+s$ is a complete square if $p^2s = r^2$ and $q = \frac{p^2}{4} + 2\sqrt{s}$.

$$x^4+px^3+qx^2+rx+s \left(x^2 + \frac{px}{2} + \frac{4q-p^2}{8}\right.$$

x^4

$2x^2+\frac{px}{2}$ | px^3+qx^2

$px^3+\frac{p^2x^2}{4}$

$2x^2+px+\frac{4q-p^2}{8}$ | $\left(q-\frac{p^2}{4}\right)x^2+rx+s.$

$\left(q-\frac{p^2}{4}\right)x^2+\frac{p(4q-p^2)}{8}x+\left(\frac{4q-p^2}{8}\right)^2$

$\therefore$ If the given quantity be a complete square,

r must equal $\frac{p(4q-p^2)}{8}$,

and s ,, ,, $\left(\frac{4q-p^2}{8}\right)^2$.

If $s = \left(\frac{4q - p^2}{8}\right)^2$

$\sqrt{s} = \frac{4q - p^2}{8}$.

$\therefore$ If $r = \frac{p(4q - p^2)}{8}$ | and $\sqrt{s} = \frac{4q - p^2}{8}$

$r = p\sqrt{s}$ | $8\sqrt{s} = 4q - p^2$

$\therefore r^2 = p^2 s$. | $4q = p^2 + 8\sqrt{s}$

| $\therefore q = \frac{p^2}{4} + 2\sqrt{s}$.

6. W. PATON, Glasgow.—Prove that :—

$$1 - n + \frac{n \cdot n - 1}{1 \cdot 2} \text{ ... to } \overline{n+1} \text{ terms} = 0,$$

when n is a whole number.

(Certificate Examination, 1881.)

$$(1 - x)^n = 1 - nx + \frac{n(n-1)}{1 \cdot 2} x^2 - \ldots$$
$$+ n(-x)^{n-1} + (-x)^n.$$

Put $x = 1$; thus

$$(1 - 1)^n = 1 - n + \frac{n(n-1)}{1 \cdot 2} x^2 - \ldots$$
$$+ n(-1)^{n-1} + (-1)^n;$$

But $(1 - 1)^n = 0$,

$$\therefore 1 - n + \frac{n \cdot n + 1}{1 \cdot 2} \text{ ... to } \overline{n+1} \text{ terms} = 0.$$

When n is a whole number.

General.

1. W. ROBERTSON, Skeld.—Dr. Smith's Smaller Histories of Greece and Rome (*Murray*); Workman's 'Matriculation Questions, with Advice to Students' (*Hughes*); and Autenrieth's Homeric Dictionary (*Macmillan*) will probably be of service to you.

2. JUVENIS, Huddersfield.—You will find the Syllabus you ask for in the February issue of this journal. You might use Fitch's 'Lectures on Teaching' in addition to your other text-book.

3. J. S., Earls Heaton.—Dr. Johnson once said to Boswell, 'Sir, hell is paved with good intentions.' This is evidently the phrase to which you refer.

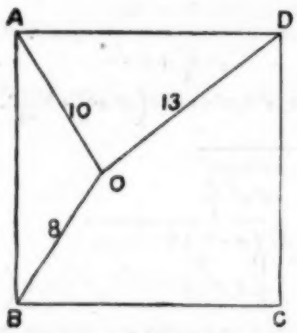
4. B. E. L.—Mr. Furness's admirable Variorum edition of 'Macbeth,' published by A. R. Smith, and price 15s., is the best you could get. You will find a cheaper one in the Clarendon Press series and in the Rugby editions.

5. EBOR.—Lyell's 'Geology' would suit your purpose.

6. DOMINICA, Cotmanhay.—See Query 14, January, '82, issue of our journal.

7. D. A., Nottingham, and GLACIER, Darwen, have forgotten to give their real names and addresses. Their queries will be answered on their doing so.

8. W. SEYMOUR, South Shields.—In a square garden a tree is so placed that its distances from three corners are 8, 10, and 13 perches, respectively; find the area of the garden.



Let ABCD be the garden, and O the position of the tree.
Then OB = 8, OA = 10, OD = 13.
Let the side of the garden = x,
Then the area " " $= x^2$.

$$\text{Sin BAO} = \frac{2}{\text{AO} \times \text{AB}} \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \frac{2}{10x} \sqrt{\left(\frac{8+10+x}{2}\right)\left(\frac{18+x}{2} - 8\right)\left(\frac{18+x}{2} - 10\right)\left(\frac{18+x}{2} - x\right)}$$

$$= \frac{1}{5x} \sqrt{\frac{18+x}{2} \cdot \frac{x+2}{2} \cdot \frac{x-2}{2} \cdot \frac{18-x}{2}}$$

$$= \frac{1}{20x} \sqrt{(18+x)(18-x)(x+2)(x-2)}$$

$$= \frac{1}{20x} \sqrt{(324 - x^2)(x^2 - 4)}$$

$$\therefore \sin^2 \text{BAO} = \frac{328x^2 - x^4 - 1296}{400x^2}.$$

$$\text{Sin DAO} = \frac{2}{\text{AO} \times \text{AD}} \sqrt{s(s-a)(s-b)(s-c)} =$$

$$\frac{2}{10x} \sqrt{\left(\frac{10+13+x}{2}\right)\left(\frac{23+x}{2} - 10\right)\left(\frac{23+x}{2} - 13\right)\left(\frac{23+x}{2} - x\right)}$$

$$= \frac{1}{5x} \sqrt{\frac{23+x}{2} \cdot \frac{x+3}{2} \cdot \frac{x-3}{2} \cdot \frac{23-x}{2}}$$

$$= \frac{1}{20x} \sqrt{(23+x)(23-x)(x+3)(x-3)}$$

$$= \frac{1}{20x} \sqrt{(529 - x^2)(x^2 - 9)};$$

But $\sin \text{DAO} = \cos(90° - \text{DAO}) = \cos \text{BAO}$:

$$\therefore \cos^2 \text{BAO} = \frac{538x^2 - x^4 - 4761}{400x^2}.$$

But $\sin^2 \text{BAO} + \cos^2 \text{BAO} = 1$.

$$\therefore \frac{328x^2 - x^4 - 1296}{400x^2} + \frac{538x^2 - x^4 - 4761}{400x^2} = 1$$

$$866x^2 - 2x^4 - 6057 = 400x^2$$
$$-2x^4 + 466x^2 = 6057$$
$$x^4 - 233x^2 + \left(\frac{233}{2}\right)^2 = \frac{54289}{4} - \frac{6057}{2}$$
$$= \frac{54289 - 12114}{4}$$
$$= \frac{42175}{4}$$
$$x^2 - \frac{233}{2} = \pm \frac{205{\cdot}3655\ldots}{2}$$
$$x^2 = \pm \frac{205{\cdot}3655\ldots}{2} + \frac{233}{2}$$
$$= \frac{438{\cdot}3655\ldots}{2} \text{ or } \frac{27{\cdot}434\ldots}{2}$$

$\therefore x^2 = 219{\cdot}1827\ldots$ or $13{\cdot}717\ldots$

It is evident that the value 13·717 is inapplicable.

$\therefore$ area of garden = 219·1827 perches.
= 1 ac. 1 ro. 19·1827 poles.

9. PUZZLED.—If you want us to answer your question, please be at the trouble to send it, and not refer us to *a book* where it may be seen.

10. LEIGH.—Hughes's Graduated Exercises in Arithmetic, or the same author's Government Inspection Cards.

11. JUNIUS.—You will find all the information you need in the Syllabus issued by the Science and Art Department.

12. INQUIRER.—The term 'Practical Geometry' shows that the problems have to be worked *practically*.

13. E. H. S.—We regret to state that your query must be held over till next month.

14. ANGLAIS.—It is quite possible to acquire a *grammatical* knowledge of French without a master. We should recommend you to use the 'Grammaire des Grammaires,' *Havet's* French Grammar, or *Chardenal's* Course.

15. GEPP.—We will, to oblige you, give eighty lines of *Burke's* Speech against Hastings in an early number of our new journal, 'The Scholar.' You can obtain a selection from Burke, published by the Clarendon Press, for about 3s. 6d.

16. A. L.—Prove that the equation $2y^2 - 3xy - 2x^2 - y + 2x = 0$ represents two straight lines which are perpendicular to each other; and that one of them passes through the point (1, 2), and the other through the point $(2, -\frac{1}{2})$.

$$2y^2-3xy-2x^2-y+2x=0$$
$$2y^2-3xy-y=2x^2-2x$$
$$y^2-\frac{3x+1}{2}y+\left(\frac{3x+1}{4}\right)^2=x^2-x+\frac{9x^2+6x+1}{16}$$
$$=\frac{25x^2-10x+1}{16}$$
$$y-\frac{3x+1}{4}=\pm\frac{5x-1}{4}$$
$$y=\pm\frac{5x-1}{4}+\frac{3x+1}{4}$$
$$\therefore\ y=2x,\text{ or } -\tfrac{1}{2}x+\tfrac{1}{2}.$$

The equation $y=2x$ represents a straight line passing through the point (1,2), and the equation $y=-\frac{1}{2}x+\frac{1}{2}$ represents a straight line passing through the point $(2,-\frac{1}{2})$.

Now, when the co-efficient of x in one equation is the negative reciprocal of the co-efficient of x in the other equation, the two straight lines are perpendicular to each other.

∴ The given equation represents two straight lines perpendicular to each other.

17. P. P.—Three consecutive angular points of a parallelogram are $(a, 0)$, (h, k), $(0, b)$, respectively; find the co-ordinates of the other angular point, and the equations to the diagonals.

The first angular point $(a, 0)$ is on the axis of x, and the third angular point $(0, b)$ is on the axis of y.

∴ It is evident that the co-ordinates of the fourth angular point are $(a-h), (b-k)$.

The general equation to the straight line which passes through two given points is :—

$$(x_2-x_1)(y-y_1)=(y_2-y_1)(x-x_1).$$

The two given points for one diagonal are $(a, 0)$, $(0, b)$, and for the other (h, k), $\{(a-h), (b-k)\}$.

Equation for one diagonal :—
$$-ay=b(x-a)$$
$$-ay=bx-ab$$
$$bx+ay=ab$$
$$\therefore\ \frac{x}{a}+\frac{y}{b}=1.$$

Equation for the other diagonal :—
$$(a-h-h)(y-k)=(b-k-k)(x-h)$$
$$\therefore\ (y-k)(a-2h)=(x-h)(b-2k).$$

18. T. A. MUMMERY, Folkestone.—Find the area of a regular polygon of 24 sides inscribed in a circle, the radius of which is one foot.

In a regular polygon of n sides inscribed in a circle of radius r,
$$\text{Area}=\frac{n}{2}r^2\sin\frac{360^\circ}{n}.$$
$$\therefore\ \text{Area of polygon}=\left(\frac{24}{2}\sin\frac{360^\circ}{24}\right)\text{sq. ft.}$$
$$=(12\sin 15^\circ)\quad\text{,,}$$
$$=(12\times\cdot258819)\quad\text{,,}$$
$$=3\cdot105828\text{ sq. ft.}$$

19. GULLIVER.—Dr. Morrison's (Gall and Inglis.) The National Society also publish a manual on the subject.

20. E. JENKINS, Pontardawe.—Consult the 'Science Directory,' which may be had through any bookseller.

21. EUREKA.—No, but if you have difficulty with any particular question, we shall be happy to help you in the *Query Column*. No answers are published.

22. ALPHA.—Write to Mr. J. Strugnell, National Society's Depository, Westminster.

23. PUZZLED.—We only answer *one* question at a time. Get (*a*) Gardner's 'How to Draw a Map,' (*b*) Johnston's 'Atlas.'

24. IGNARUS.—Grammarians differ. No examiner would reject an intelligent answer.

25. P. T., Macclesfield.—Yes.

26. THREE OF US.—Write to Longmans and Co. for their 'Civil Service Guide.'

27. J. S. M.—You can take which year you prefer.

28. G. GUPPY.—*Année* represents duration.

29. JEMMY JOHNSON.—By all means sit for scholarship. Write to Messrs. Longmans for their 'Civil Service Guide.'

30. SEVERN.—(*a*) No syllabus issued. See questions in previous Nos. of PRACTICAL TEACHER. (*b*) Application should be made at once. (*c*) Writing and composition *good*.

31. J. E. ROWLEY.—No paper issued. Avail yourself of our *Query Column*.

32. W. H. G.—(*a*) Right style—high percentage. (*b*) Most probably.

33. PUPIL TEACHER.—The trade does not know the book, which is probably out of print.

34. CURIOUS.—The word you mention occurs in Mr. Tennyson's 'Dream of Fair Women':—

> 'Moreover, it is written that my race
> Hew'd Ammon, hip and thigh, from Aroer
> On Arnon unto Minneth.'

Aroer was a town by the bank of the river Arnon. See the 2nd and 3rd chapters of the Deuteronomy of Moses. We should advise you to give a spare moment to your spelling. Most people do *not* make *oblidge* spell oblige.

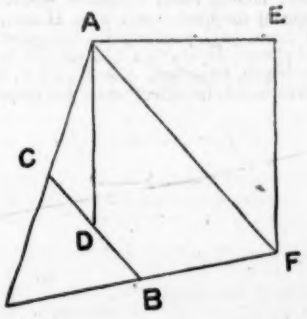
35. PARADOX.—A weight is just supported on a rough inclined plane of inclination α by a force P acting parallel to the plane. If the inclination be changed to $\frac{\pi}{2}-\alpha$, a force 2P is required to support it. Prove that, $\cos(\alpha+\lambda)=2\sin(\alpha-\lambda)\tan\lambda$ being the co-efficient of friction.

$$(1)\ \mathrm{P}=\mathrm{W}\frac{\sin(\alpha-\lambda)}{\cos\lambda}$$
$$(2)\ \mathrm{P}=\mathrm{W}\frac{\sin\left(\frac{\pi}{2}-\alpha-\lambda\right)}{\cos\lambda},$$

Dividing (1) by (2),
$$1=\frac{\sin(\alpha-\lambda)}{\sin\left(\frac{\pi}{2}-\alpha-\lambda\right)}$$
$$\text{But, }\sin\left(\frac{\pi}{2}-\alpha-\lambda\right)=\cos(\alpha+\lambda)$$
$$1=\frac{\sin(\alpha-\lambda)}{\cos(\alpha+\lambda)}$$
$$\therefore\ \cos(\alpha+\lambda)=2\sin(\alpha-\lambda).$$

36. Λύσις.—A heavy wire is bent at its middle point, so as to contain an angle of 60°; it is suspended from one of its ends; find its position in equilibrium. (Magnus' 'Mechanics.')

If C and B be the middle points of the two parts, and CB be bisected in D, D must be vertically under A the point of suspension. The position of the wire may be found by drawing a horizontal line through A, and marking off a distance AE equal to $\sqrt{\frac{3}{7}}$ of a, where a is the length of half the wire, and then dropping a vertical EF equal to $\frac{2}{\sqrt{7}}$ of a. If AF be joined and an equilateral triangle described on it, the two sides will be the position of the wire.



The lengths of AE and EF are calculated thus:—
In the triangle ACD—

$$AD^2 = AC^2 + CD^2 - 2\,AC.CD\cos ACD$$
$$= \left(\frac{a}{2}\right)^2 + \left(\frac{a}{4}\right)^2 - 2\times\frac{a}{2}\times\frac{a}{4}\times\cos 120^\circ$$
$$= \frac{a^2}{4} + \frac{a^2}{16} - \left(\frac{a^2}{4}\times -\cos 60^\circ\right)$$
$$= \frac{5a^2}{16} - \left(\frac{a^2}{4}\times -\tfrac{1}{2}\right)$$
$$= \frac{5a^2}{16} + \frac{a^2}{8}$$
$$= \frac{7a^2}{16};$$
$$\therefore AD = \frac{a}{4}\sqrt{7}$$
$$\sin ADC : \sin ACD :: AC : AD$$
$$\sin ADC : \sin 120^\circ :: \frac{a}{2} : \frac{a}{4}\sqrt{7}$$
$$\sin ADC : \frac{\sqrt{3}}{2} :: 2 : \sqrt{7}$$
$$\therefore \sin ADC = \sqrt{\tfrac{3}{7}}.$$

But $\angle FAD = \angle ADC$ (I. 29),
And $\angle EAF$ = complement of $\angle FAD$.
$$\therefore \cos EAF = \sin ADC = \sqrt{\tfrac{3}{7}};$$
$$\text{But } \cos EAF = \frac{AE}{AF}.$$
$$\therefore \frac{AE}{AF} = \sqrt{\tfrac{3}{7}}$$
$$\frac{AE}{a} = \sqrt{\tfrac{3}{7}}$$
$$\therefore AE = a\sqrt{\tfrac{3}{7}}.$$
$$AF^2 = AE^2 + EF^2 \text{ (I. 47)}$$
$$a^2 = \left(a\sqrt{\tfrac{3}{7}}\right)^2 + EF^2$$
$$= \frac{3a^2}{7} + EF^2$$
$$\frac{4a^2}{7} = EF^2$$
$$\therefore EF = \frac{2a}{\sqrt{7}}.$$

37. NORMAN H.—No. 1 query in Geometry is to bisect *any* triangle by a line drawn parallel to one side. Your query is a particular case, and can be solved in the same way, or thus:—Bisect AC, one of the sides of the equilateral triangle in D, and erect the perpendicular DE=AD. Join AE, and with centre A and radius AE describe an arc cutting AC in F. Through F draw FG parallel to BC. Then AGF shall be half the triangle ABC. It can be proved by the same method as the general case.

In the deduction you refer to it would have been preferable to prove that AE falls nearer to AC, the greater side, than AD. The proof is very simple.

38. SPHINX, Cornwall.—*θάνω* from *θνήσκω*, active voice, subjunctive mood, 2nd aorist, first person singular; *ὄψω* for *ὄψσι*, Homeric for *αἷς* (see smaller Liddell and Scott, page 487), dative feminine plural; *ἀνέσχετο* from *ἀνέχω* (Liddell and Scott, page 60), 2nd aorist, middle voice, indicative mood, 3rd singular; *πείθοντο*, augment dropped—usual with Homer,—from *πείθω* (Liddell and Scott, 523), passive voice, indicative mood, imperfect tense, 3rd plural; *ἔτοντο* (see Liddell and Scott, 256) from *ἵπω*, middle *ἕπομαι*, imperfect, *sine* augment; *ἐπόμην*, middle voice, indicative mood, imperfect tense, 3rd plural.

—o—

Training Colleges.

GENERAL EXAMINATION, 1881.

SECOND YEAR.—(*continued.*)

MALE CANDIDATES.

Geography.

Two hours and a half allowed for this Paper.

Every candidate must draw one of the maps in Question 1. Not more than *seven* of the other questions may be answered.

1. Draw a map of—
   (*a*) Ireland.
   Or (*b*) British North America.
   Or (*c*) The Colonies of Queensland, New South Wales, and Victoria.

N.B.—Each map should be drawn on a scale sufficient to occupy all the blank space available. If the candidate put in, and correctly number the lines of latitude and longitude, it will add to the value of the exercise.

Places must not be indicated by letters or figures, referring to a list of names at the side, but *the names themselves must be inserted in the map.*

2. Show that the coast of England is generally bold and deeply indented, and name the districts which present especial exceptions to this statement.

3. Describe the positions of, and the historical associations connected with, St. Albans, Ely, Tewkesbury, Torbay, Stirling, Glencoe, and Carnarvon.

4. Name the counties in which the towns of Preston, Wakefield, Dundee, Coventry, Bolton, Belfast, Paisley, Halifax, Dudley, and Stroud are situated, and state the principal industries of each district.

5. 'The rivers of Scotland are navigable only for short distances, but possess wide estuaries.'

Explain the physical character of the country in its bearing upon this statement.

6. 'No part of Ireland is more than sixty miles distant from some inlet of salt water.'

Explain this statement and name some of the principal inlets.

7. Describe fully the great central plain of Ireland.

8. Describe the position of Aden, Lagos, Singapore, and Barbadoes, and gives the dates and circumstances of their being annexed to the British Empire.

9. Name the chief plains and plateaux of Hindustan, and give a brief description of the most southerly plateau.

10. Give some of the historical associations connected with Benares, Lahore, Seringapatam, Plassy, Arcot, and Lucknow.

11. Enumerate the chief exports of Natal, Queensland, and Jamaica.

12. Name the principal rivers of the Canadian Dominion, the towns on their banks, and the seas into which they flow.

13. Describe briefly a voyage by sea from London to Cape Town, Galle, and Calcutta.

14. Give some account of the climate, the native race, and the chief productions of New Zealand.

15. Describe fully the boundaries and physical features of Western Australia.

Euclid.

Three hours allowed for this Paper.

(Not more than *nine* questions to be answered.)

N.B.—Capital letters, not numbers, must be used in the diagrams.

The only signs allowed are + and =. The square on AB may be written 'sq. on AB,' and the rectangle contained by AB and CD, 'rect. AB, CD.' Other abbreviations, if employed, must not be ambiguous.

1. If two triangles have two angles of the one equal to two angles of the other, each to each, and the sides adjacent to the equal angles in each equal the third angle of the one shall be equal to the third angle of the other.

In the equilateral triangle ABC, BD, and CE, which bisect the angles at B, C, intersect each other in O and the opposite sides in D, E; show that OD=OE.

2. To divide a given straight line into two parts so that the difference of the squares on the whole line and on one of the parts may be equal to a given rectangle, which is not greater than the square on the whole line.

3. If a straight line touch a circle the straight line drawn from the centre to the point of contact shall be perpendicular to the line touching the circle.

Find the locus of the points, from which tangents can be drawn to a given circle equal to its radius.

4. To draw a chord through a given point within a given circle that shall be equal to a given line.

Show that this is only possible within certain limits, and draw the longest and shortest chords that can be drawn through the point.

5. In a circle the angle in a semicircle is a right angle.

The circle ABC passes through the centre of the circle DBC; find the point of intersection of the tangents to DBC at the points BC.

6. In equal circles, the angles which stand upon equal arcs are equal to one another, whether they be at the centres or circumferences.

Show that the arcs subtended by one of the angles of an equilateral triangle, and by one of the smaller angles of a right angled isosceles triangle, which are inscribed in a circle, are in the ration of 4 : 3.

7. If from any point without a circle two straight lines be drawn, one of which cuts the circle but does not pass through the centre, and the other touches it, the rectangle contained by the whole line, which cuts the circle and the part of it without the circle, shall be equal to the square on the line which touches it.

If perpendiculars BD, CE be drawn from the angular points, B, C of the triangle ABC upon the opposite sides, show that the rectangle contained by AB and AE is equal to the rectangle contained by AC and AD.

8. In a given circle inscribe a triangle equiangular to a given triangle.

If the given triangle be equilateral and its base equal to the radius of the circle, compare the areas of the two triangles,

9. To inscribe an equilateral and equiangular pentagon in a given circle.

Show that the line drawn from the apex of the isosceles triangle, required in the figure, to the intersection of the lines bisecting the angles at the base, is greater than the radius of the circle.

10. The sides about the equal angles of triangles which are equiangular to one another are proportional.

11. In a right angled triangle, if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to one another.

If the segments of the base are in the ratio of 4 : 1, find the ratio of the squares on the sides.

12. Two circles ABC and ABD, intersect in A, B, show that the tangent to ABD at A cannot be parallel to the tangent to ABC at B, unless the circles are equal.

13. Two equal circles touch another circle externally at the extremeties of a diameter: if the radius of the latter circle be double of the radius of the others, compare the areas of the squares constructed on the diagonals of the rhombus formed by the common tangents to the circles.

14. To find a point without two given circles from which four equal tangents of given length can be drawn to the two circles.

15. Show that the circle which passes through the middle points of the side of a triangle passes through the feet of the perpendiculars from the angles upon the opposite sides.

Algebra and Mensuration.

Three hours allowed for this Paper.

Candidates are not permitted to answer more than *twelve* of these questions.

The *solution* must be given at such length as to be intelligible to the Examiner, otherwise the answer will be considered of no value.

[NOTE.—In all problems, where required, the circumference of a circle may be assumed to be=($\frac{22}{7}$)ths of the diameter. Not more than 2 decimal places are required in the answers.]

1. Prove the rule for converting mixed circulating decimals to vulgar fractions.

2. If y varies as x^2 and $y = 5$, when $x=4$, find the value of x when $y=125$.

3. If x, y, z are in harmonical progression, then $\frac{x}{y+z}, \frac{y}{x+z}, \frac{z}{x+y}$ are also in harmonical progression.

4. Solve the equations—

$$\left.\begin{aligned} \frac{1}{x}+\frac{3}{y}&=\frac{3}{2} \\ \frac{3}{x}+\frac{7}{y}&=\frac{23}{6} \end{aligned}\right\} \quad (1.)$$

$$\left.\begin{aligned} x^2-y^2&=75 \\ xy&=154 \end{aligned}\right. \quad (2.)$$

5. Show that x^2+y^2 is never less than $2xy$ and $x+\frac{1}{x}$ is never less than 2, when x and y are real and positive.

6. Find the co-efficient of x^4 in the expansion of $(1-x^2+x^3)^3$; and prove that $1-n+\frac{n.n-1}{1.2}$ .. to $\overline{n+1}$ terms=0, when n is a whole number.

7. Show that the number of combinations of n things taken r together is the same as the number of combinations taken $n-r$ together. Show that a greater number of words containing 8 letters can be formed out of 12 letters than of words which contain only 3.

8. When $n+1$ figures of a square root have been found by the usual method, show that n more can be obtained by division only; and find the square root of 3 to four places of decimals.

9. If a, b be employed as bases of logarithms, show that $\log_b M=\log.^b a\times\log.^a M$. Given log. 15=1.1760913, log. 2=.3010300, find log. 3, log. 225, and log. $\sqrt{75}$.

10. Find a formula to express the present value of an annuity, to commence at the end of m years and then to continue n years.

11. The sum of four numbers in arithmetical progression is $19\frac{1}{2}$, and the sum of the products taken two and two together is $138\frac{11}{16}$; find the numbers.

12. Given n straight lines, of which no three pass through the same point and only two are parallel, find the number of intersections of the lines.

13. Find in chains the area of the largest rectangle that can be enclosed by 240 hurdles each 18 feet long.

14. Find the radius of a hollow sphere which is an inch thick, and contains the same amount of gold as a solid sphere whose radius is 7 inches.

15. The sides of a right-angled triangle are in arithmetical progression and its area is 150 feet; find its sides.

16. The densities of two similar cones vary directly as the squares of their heights, find the height of the larger cone weighing 216 times as much as the smaller, which has a height of six feet.

Political Economy.

Three hours allowed for this Paper.

Candidates are not permitted to answer more than eight questions.

1. Explain the term 'Social Economy,' showing especially that it is wider in application than the science of political economy,

2. Distinguish 'productive' and 'unproductive labour.' Under which of the two heads would you place the construction and maintenance of a park for the people, the labour of railway servants employed in pleasure traffic on Sundays, and the duties of over-lookers of labour? Give your reasons.

3. Give approximately the amount of the English public debt; explain the term Consols, and give some reasons for the price of Consols in 1881.

4. Explain the terms 'Fair Trade,' Free Trade,' 'Reciprocity,' and 'Most favoured nations clauses' in treaties of commerce.

5. Explain generally how a large increase in our carrying trade and foreign investments may have effected the relative amounts of exports and imports in the sum total of English commerce.

6. Show the effects of a bad harvest at home on the home trade and manufactures.

7. State some of the chief advantages and disadvantages of a bi-metallic system of coinage.

8. Show generally what effect the growth of a large manufacturing town has upon the value of land in the immediate neighbourhood.

9. Point out the chief advantages which enable a farmer in the West of America to compete with the English farmer in the home market.

10. What data would be required for determining whether an agricultural labourer earning 15s. a week is in a better or worse position than a labourer in a large town earning 25s. a week?

11. Give reasons showing that each trade tends to have a certain rate of profit, and account for the difference of the rates of profit in a large co-operative store and in a shop in a country village.

12. Distinguish between saving and parsimonious habits; name some of the safest modes of investing small savings, and account for the variation in the amounts of interest to be fairly expected in each that you have named.

13. Show the advantages of co-operation between the capitalist and his workmen in obviating disputes about wages and recourse to arbitration.

14. Discuss the question whether a high rate of interest is compatible with security of investment.

15. Enumerate the principal articles that have been totally or partially relieved from taxation in the present reign, and explain the principles on which a high rate of duty is still levied on certain articles.

FIRST YEAR.

MALE CANDIDATES.

Mental Arithmetic.

N.B.—Do not turn this paper till you are told to do so.

Twenty minutes allowed for this Paper.

You are to enter the answer in the space ( ) left for it after each question. Nothing is to be written on this paper, except the particulars required in the above table, and the answers (which must be written in ink) to the questions on the other side. No erasures or alterations are permitted. They will be marked as errors.

1. $(6017+1008)-(4018+1007)=$
2. $1007\times1009=$
3. $\frac{1}{17}$ of $3\frac{5}{7}\times4\frac{1}{2}=$
4. Goods bought for 1s. 7½d. sold for 2s. 2d., the gain per cent. =
5. $13^3-13^2-12^2=$
6. If 12 score cost £11 5s., the price of one article =
7. The number of francs, at 10d. each, in 50 guineas =
8. The real value of £1,000 in the 3 per cent. stocks when an investment produces 2¾ per cent. =
9. Compound interest on £250 for 3 years at 20 per cent. =
10. The number of cubic feet in a box 5½ feet long, 4½ feet broad, 16 inches deep.
11. The prime numbers in 289289 are =
12. The average of 2023, 2045, 2075, 3017 =
13. The accommodation of a school 56 feet long, 20 feet broad, 12 feet high, at 80 cubic feet per child =
14. The remainder of $(7365\times5087)\div9=$

Alternative Paper.

1. If 13 score cost £16 5s., the price of one article =
2. The number of francs, at 10d. each, in 40 guineas =
3. The number of cubic feet in a box 4½ feet long, 3¼ feet broad, 8 inches deep =
4. $(7018+2009)-(6019)+2008)=$
5. The remainder of $(9875\times4089)\div9=$
6. Compound interest on £640 for 3 years at 25 per cent. =
7. The average of 1017, 1025, 1095, 2833 =
8. The accommodation of a school 60 feet long, 19 feet broad, 16 feet high, at 80 cubic feet per child =
9. $\frac{1}{13}$ of $5\frac{3}{7}\times5\frac{1}{2}=$
10. Goods bought for 1s. 10½d. sold for 2s. 1d., the gain per cent. =
11. $1003\times1005=$
12. The real value of £700 in the 4 per cent. stocks when an investment produces 3½ per cent. =
12. The prime numbers in 169169 are =
14. $14^3-13^3-13^2=$

FIRST AND SECOND YEARS.

MALE CANDIDATES.

Dictation and Penmanship.

Twenty minutes allowed for these Exercises.

Candidates are not to *paint* their letters in the *Copy-setting Exercise*, but to take care that the copy is clean and without erasures.

Omission and erasures in the *Dictation Exercise* will be counted as mistakes.

The words must not be divided between two lines; there is plenty of room for the passage to be written.

Write in large hand, as a specimen of Penmanship, the word *Insuperable.*

Write in small hand, as a specimen of Penmanship, the sentence—

Revenge is a kind of wild justice.

Dictation.

Write the passage dictated to you by the Examiner.

(For the Examiner.)

One passage is given for Candidates of both Years.

The passage should be read *once* distinctly, and then dictated *once*, in portions as marked.

If the room is large, and there is danger of your not being heard at its extremity, you may permit one of the officers of the College to stand half-way down the room, and repeat the words after you, exactly as you give them out.

It is essential that there be no complaint on the part of the Candidates that they could not hear or understand: you can prevent this only by clearness, accuracy, and audibility.

The characteristic result | of this Monarch's policy | was the consolidation of Western society. | His imperial schemes | give place to a growing feudalism, | in which independent chieftains | sub-divide the imperial domains, | forming political organisations | with some degree of central activity, | and replacing the shapeless chaos | of previous centuries. | In a life recklessly active | he reformed the coinage, | collected libraries, interfered in religious controversies, | attempted the magnificent enterprise | of uniting the Rhine and the Danube, | and meditated the task of moulding the discordant Codes | of Roman and barbarian laws | into an uniform system. |

FIRST YEAR.

MALE AND FEMALE CANDIDATES.

Languages.

Four hours allowed for this paper.

Male candidates may answer questions in *two* languages, Female candidates in *one* only.

Latin.

SECTION I.

1. Translate into English—

(*a*) Prima luce, confirmata re ab exploratoribus, omnem equitatum qui novissimum agmen moraretur præmisit.

(*b*) Titus Labienus castris hostium potitus et ex loco superiore quæ res in nostris castris gereretur conspicatus decimam legionem subsidio nostris misit. Qui cum ex equitum et calonum fuga quo in loco res esset quantoque in periculo et castra et legiones et imperator versaretur cognovissent nihil ad celeritatem sibi reliqui fecerunt.

2. Parse moraretur, castris, gereretur, subsidio, cognovissent, reliqui, sibi.

3. Translate into English—

Instructo exercitu, magis ut loci natura dejectusque collis et necessitas temporis, quam ut rei militaris ratio atque ordo postulabat, quum diversis legionibus abæ alia in parte hostibus resisterent, sepibusque densissimis, ut ante demonstravimus, interjectis prospectus impediretur, neque certa subsidia collocari, neque quid in quaque parta opus esset provideri, neque ab uno omnia imperia administrari poterant. Itaque in tanta rerum iniquitate fortunæ quoque eventus varii sequebantur.

Explain the subjunctive moods in this passage. Account for the case of "diversis legionibus." Might the structure of this sentence have been different?

Greek.

SECTION I.

1. Translate into English:—

(*a*) Εἰ δὲ δὴ καὶ μανέντες σὲ κατακτείναμεν, ἄλλο τι ἂν ἢ τὸν ἐνεργέτην κατακτείναντες πρὸς βασιλέα τὸν μέγιστον ἔφεδρον ἀγωνιζοίμεθα.

(*b*) Καὶ γὰρ οὖν φυγῇ μὲν καὶ εὐνοίᾳ ἑπομέναις οὐδέποτ' εἶχεν· οἵτινες δὲ ἢ ὑπὸ πόλεως τεταγμένοι ἢ ὑπὸ τοῦ δεῖσθαι ἢ ἄλλῃ τινὶ ἀνάγκῃ κατεχόμενοι παρείησαν αὐτῷ σφόδρα πειφομένοις ἐχρῆτο.

2. Parse μανέντες εἶχεν, τεταγλένοι παρείησαν, ἐχρῆτο.

3. Translate into English :—

Νεανίσκος δέ τις τῶν παρόντων ἐνωήσας εἶπεν, ὡς οὐκ ἀκόλουθα εἴη τό τε ἐπιθήσεσθαι καὶ το λύσειν τὴν λέφυραν. Δῆλον γὰρ ὅτι ἐπιτιθεμένους ἢ νικῶν δεήσει ἢ ἡττᾶσθαι. Ἐὰν μὲν οὖν νικῶσι, τί δεῖ αὐτοὺς λύειν τὴν γέφυραν; οὐδὲ γὰρ, ἂν πολλαὶ γέφυραι ὦσιν, ἕχοιμεν ἂν ὅποι φυγόντες ἡμεῖς σωθεῖμεν. Ἐὰν δὲ ἡμεῖς νικῶμεν, λελυμένης τῆς γεφύρας οὐχ ἕξουσιν ἐκεῖνοι ὅποι φύγωσιν· οὐδέ μὴν βοηθῆσαι πολλῶν ὄντων μέραν, οὐδεὶς οὑτοῖς δυνήσεται, λελυμένης τῆς γεφύρας.

Latin.

SECTION II.

Translate into Latin—

(*a*) I hope to come to you to-morrow.
They concealed their crimes from their father.
He threatened (minor) me with death.
He is engaged (versor) in writing letters.
He said that he was a general.
I am trusted (credo).
I asked (rogo) him why he did this.

(*b*) Our *forces* (omit this word) attacked the enemy while-labouring-under-the-disadvantages (impedire) of crossing (in) the river, and slew a large number of them.

(*c*) Cæsar, having at once heard of this through his scouts (speculator), dreading (voreor) an ambuscade, because he had not yet seen for what reason they were departing, kept his infantry and cavalry within the camp.

(*d*) If I had been Marius, I would have acted thus.
That pillar is sixty feet higher than the wall of the city.

(*e*) Cæsar, on his return from Britain, said that he would punish, with the utmost severity, the tribes who had rebelled against him, and refused to supply his army with corn.

Greek.

SECTION II.

Translate into Greek—

(*a*) I came (ἔρχομαι) from the river.
I came to the river.
I was by the river.

[N.B.—The same preposition is to be used to express from, to, and by.]

He said (φημί) that he was a general (στράτηγος).
If he had anything, he would give it.
If he had had anything, he would have given it.

(*b*) And he asked (ἐρωτάω) again: shall I take-a-message-of (ἀπαγγέλλω) peace (σπόνδαι) or war. And Clearchus answered again *in* the same *words*—Peace, If we remain (literally to us remaining); war, if we go backwards or forwards. But he did not actually (say διασημαίνω) what he would do. [N.B.—Omit the words in italics when translating.]

(*c*) They fell before they conquered.

(*d*) Do not write before you learn.

(*e*) The citizen wounded the general with a sword.

Latin.

SECTION III.

Question 1. Decline conjux fidelis,—sincerum vas—and give the genders and genitive cases of auriga, pelagus, imber, plebs, sanguis, cespes, dies, nurus, paries.

Question 2. Give the comparative and superlative of pauper, audax, facilis, gravis, tener, nequam, benevolus, malus, dives, senex.

Question 3. Give the perfect and supine of rapio, crepo; aperio, ferveo, peto, arcesso, retundo, comperio, sterno, fio, audeo, audio, cano, curro, vivo, vinco, vincio.

Question 4. Distinguish between vas and præs, simulo and dissimulo, agmen and acies, paries, murus and mœnia.

Question 5. Correct—perfunctum meum officium est (my duty is discharged) : humilissimus (lowest). Distinguish between—

consulere { senatum, / senatui, / in senatum. } | timeo { te / tibi }

Greek.

SECTION III.

Question I. Decline πόλις, ὄφις, ἀιδώς, in the singular; and ἐπιστογὴ and βασιλεὺς in the dual and plural.

Question 2. Compare φίγος μέγας ἥσυχος, ἡδὺς, παγὺς, καγὸς, and ἄφρων.

Question 3. Decline throughout σὺ, ἐμαυτοῦ, εἷς.

Question 4. Give the principal tenses in use of βαίνω, πίνω, τέμνω, βάγγο, φημί, φέρω.

Question 5. Distinguish between σίγα, σίγᾷ, σῖγα—ή, ἦ, ἤ, ἦ, ἦ.

German.

SECTION I.

1. Translate into English :—

(*a*) Nach Tische eilte ich mir erst einen Eindruck des Ganzen zu versichern, und warf mich, ohne Begleiter, nur die Himmel gegenden merkend, ins Labyrinth der Stadt, welche obgleich van Canälen durchschnitten, durch Brücken wieder zusammenhängt. Die Enge und Gedrängtheit des Ganzen denkt man nicht, ohne es gesehen zu haben. Gewöhnlich kann man die Breite der Gasse mit aus gereckten Armen entweder ganz oder beinahe messen, in den engsten stösst man schon mit den Ellbogen an, wenn man di Hände in die Seite stemmt : es giebt wohl breitere, auch hie und da ein Plätzchen, verhaltnissmässig aber kann alles enge genannt werden. Ich fand leicht den grossen Canal und die Hauptbrücke Rialto; sie besteht aus, einem einzigen Bogen von weissem Marmor. Von oben herunter ist es eine grosse Ansicht, der Canal gesäet voll Schiffe, die alles Bedürfniss vom festen Lande herbeiführen; dazwischen wimmelt es von Gondeln.

(*b*) Beim Aufräumen fallen mir einige Eurer lieben Briefe in die Hand, und da treffe ich beim Durchlesen auf den Vorwurf dass ich mir in meinen Briefen widerspreche. Das kann ich zwar nicht merken; denn was ich geschrieben habe, schicke ich gleich fort, es ist mir aber selbst sehr wahrscheinlich, denn ich werde von ungeheuern Mächten hin und wieder geworfen, und da ist es wohl natürlich dass ich nicht immer weiss wo ich stehe,

2. Parse messen, stosst an, Schiffe, wimmelt, geworfen. giving the principal tenses of the verbs.

French.

SECTION I.

Translate into English :—

(*a*) Le ceil s'est assombri, un vent froid commence à venir du couchant; toutes les fenêtres qui s'étaient ouvertes aux rayons d'un beau jour, ont été renfermées. De l'aufre côté de la rue seulement le locataire du dernier étage n'a point encore quitté son balcon. On reconnaît le militaire à sa démarche cadencée à sa moustache grise et au ruban qui orne sa boutonnière : on le devinerait à ses soins attentifs pour le petit jardin qui décor sa galérie aérienne : car il y a deux choses particulièrement aimées de tous les vieux soldats, les fleurs et les enfants. Longtemps obligés de regarder la terre comme un champ de bataille, ils semblent commencer la vie à l'âge où les autres la finissent. Les goûtes des premières années, arrêtés chez eux par les rudes devoirs de la guerre refleurissent, tout à coup, sous leurs cheveux blancs.

(*b*) Depuis le premier jour j'ai suivi les progrès de cet établissement. J'ai vu l'oiseau y transporter successivement la paille, la mousse, la laine, destinées à la construction de sa demeure, et j'ai admiré l'adresse dépensée dans ce difficile travail, Auparavant, mon voisin des toits perdait ses journées à voleter sur le peuplier du jardin, et à gazouiller le eong des gouttières. Le métier des grands seigneurs semblait le seul qui lui convînt : puis tout à coup la nécessité de préparer un abri à sa couvée a transformé notre oisif en travailleur. Il ne s'est plus donné ni repos, ni trève. Eloquent example de ce que peut la nécessité !

2. Parse s'est assombri, du couchant, on reconnaît, qui lui convînt, oisif, peut.

German.

SECTION 2.

Translate into German :—

(*a*) I was reminded of a plaything, of which I had not thought for twenty years.

(*b*) The theatres get their names from the churches to which they lie nearest.

(*c*) In a hall of the palace the judges sat.

(*d*) The gondolas do not venture out.

(*e*) We are assured that Frederick the Great is really at Catholic.

(*f*) The crab is deficient in strength.
(*g*) I could have run through the city in two hours.
(*h*) If I stayed for the summer in Rome, I should not come home before the spring.
(*i*) The days were perceptibly lengthening (zunehmen).
(*k*) Get up early to morrow.

French.

SECTION 2.

Translate into French :–

(*a*) An old maid.
(*b*) They have lived in the same room for thirty years.
(*c*) The carpenter has just been sent for to the palace.
(*d*) There is always something sad about the sunset.
(*e*) For want of air the rose-tree did not grow.
(*f*) The more anxiety (empressement) I showed, the more obstinate he became.
(*g*) The barrack was in-the-neighbourhood-of (adj.) the hospital.
(*h*) What shall we do with our poor?
(*i*) I did not think you were such an early riser.
(*k*) What do you wish me to do?

German.

SECTION 3.

1 Give the genders and plurals of Ohr, Zahn, Landsmann, Wald, Schuh, Knopf, Worf, Thräne, Bettler.

2. Give the general rules for the position of the subject in a sentence, with examples.

3. Give the diminutive terminations with their gender : give examples of anomalies arising hereunder.

7. Write out the past tense and past participles of eilen, antworten, eken, denssen, fahren.

5. Show that the silent letters in the English words, "brought, should, plough, dough, calf, eight, high, rought, weight, might," are etymologically useful as marking the relation to German.

French

SECTION 3.

1. In what cases is "lequel" used instead of "qui," and why? Give illustrations.

2. What is the usual auxiliary of the past tense in the active voice? State the exceptions and explain them.

3. Give a list of French demonstrative adjectives and pronouns, distinguishing carefully between them.

4. Explain the following phrases:—Tout à l'heure: il a épousé pas mal de fermes: une route de traverse : l'oreille au guet: j'ai salué ta venue.

5. Express in French—I have just dined. Do not sit down. Have you a headache? She got up this morning at six. I beg your pardon. You want some fresh meat. It rained last week. He was only eight years old. Here is the dining-room. London is the largest town in England.

SECOND YEAR.

MALE AND FEMALE CANDIDATES.

Languages.

Four hours allowed for this paper.

Male Candidates can answer questions in *two* Languages; *Female* candidates in *one* only.

Latin.

SECTION I.

1. Translate into English :—

(*a*) Unum petere ac deprecari: si forte pro sua clementia ac mansuetudine, quam ipsi ab aliis audirent, statuisset, Aduaticos esse conservandos, ne se armis despoliaret. Sibi omnes finitimos esse inimicos ac suæ virtuti invidere; a quibus se defendere traditis armis non possent. Sibi præstare, si in eum casum deducterentur, quamvis fortunam a populo Romano pati, quam ab his per cruciatum interfici inter quos dominari consuessent.

(*b*) Quæ postquam vates sic ore effatus amico est,
Dona dehinc auro gravia sectoque elephanto
Imperat ad naves ferri, stipatque carinis
Ingens argentum, Dodonæosque lebetas,
Loricam consertam hamis auroque trilicem,
Et conum insignis galeæ cristasque comantes,
Arma Neoptolemi. Sunt et sua dona parenti.

2. Parse consuessent, secto, ferri, consertam, parenti.

3. Translate into English :—

Sum patriâ ex Ithacâ, comes infelicis Ulixi,
Nomen Achemenides, Trojam genitore Adamastro
Paupere (mansissetque utinam fortuna!) profectus.
Hic me, dum trepidi crudelia limina linquunt,
Immemores socii vasto Cyclopis in antro
Deseruere. Domus sanie dapibusque cruentis,
Intus opaca, ingens: ipse arduus, altaque pulsat
Sidera (Di, talem terris avertite pestem!)
Nec visu facilis, nec dictu affabilis ulli.
Visceribus miserorum et sanguine vescitur atro.

Greek.

SECTION I.

1. Translate into English :—

(*a*) Αὐτὰι δὲ αἱ βάλανοι τῶν φοινίκων, οἷας μὲν ἐν τοῖς Ἕλλησι ἔστιν ἰδεῖν, τοῖς οἰκέταις ἀπέκειντο· αἱ δὲ τοῖς δεσπόταις ἀποκείμεναι ἦσαν ἀπόλεκτοι, θαυμάσιαι τὸ κάλλος καὶ τὸ μέγεθος· ἡ δὲ ὄψις ἡλέκτρου οὐδὲν διέφερεν· τὰς δέ τινας καὶ ξηραίνοντες τραγήματα ἀπετίθεσαν. Καὶ ἦν καὶ παρὰ πότον ἡδὺ μέν κεφαλαλγὲς δέ.

(*b*) χόρευσε δ' ἀμφὶ σὰν κιθάραν,
Φοῖβε, ποικιλόθριξ
νεβρὸς ὑψικόμων πέραν
χαίρουσ' εὔφρονι μολπᾷ.

(*c*) πρὸς τῶν ἐχόντων, Φοῖβε, τὸν μόμον τίθῃ.

(*d*) δμαθέντας γὰρ ἀνίστη.

(*e*) ἡ τέμω τρίχα;

(*f*) οἷας ἡμπλακες ξυναόρου.

2. Parse ἀπετίθεσαν, σὰν, ἐλατᾶν, προϊέναι, συμμίξειαν, φαίη καθίσειν, ἀπιοῦσι, ἑλόμενοι, θέμενοι, ἑλούσατο, ἐκταθήσεται, ἀμπετάσας, ᾗδε, μεθορμιεῖ, συθεὶς, ἐξελᾷ κατερρύγασιν.

3. Translate into English :—

Ἀλλ' ἥδομαι μέν, ὦ, Κλέαρχε. ἀκούων σον φρονίμους λόγους· ταῦτα γὰρ γιγνώσκων, εἴ τι ἐμοὶ κακὸν βουλεύοις, ἅμα ἂν μοι δοκεῖς καὶ σαυτῷ κακόνους εἶναι. Ὡς δ' ἂν μάθῃς, ὅτι συδ' ἂν ὑμεῖς δικαίως οὔτε βασιλεῖ οὔτ' ἐμοὶ ἀπιστοίητε, ἀντάκουσον. Εἰ γὰρ ὑμᾶς ἐβουλόμεθα ἀπολέσαι, πότερα, σοι δοκοῦμεν ἱππέων πλήθους ἀπορεῖν, ἢ πεζῶν, ἢ ὁπλίσεως, ἐν ᾗ ὑμᾶς μὲν βλάπτειν ἱκανοὶ εἴημεν ἄν, ἀντιπάσχειν δὲ οὐδεὶς κίνδυνος;

Latin.

SECTION II.

Translate into Latin :—

(*a*) He promised to give me a book.
The soldiers kept-on-asking their general for money.
Cæsar said that if I wrote (scribo) he would answer (respondeo).
It does not matter (interest) to me whether he be alive or dead.

(*b*) He showed *them* (historic present) how important it was (intersum) for the state and the general safety that the forces of the enemy should-be-kept-apart (distineo), so that they might not be-obliged-to-fight (confligere) with so large a number at one time.
Cæsar, when he heard that the Helvetii had conveyed a large part of their forces across the river, resolved to attack the remainder, still encumbered with baggage, and not expecting his arrival.

(*d*) As he could not punish the Germans, who had taken refuge in the dense forests on the other side of the Rhine, Cæsar ordered a bridge to be immediately built over that wide, deep, and rapid river.

Greek.

SECTION II.

Translate into Greek :—

(*a*) And when they had-taken-their-stand (ἵστημι) within hearing distance (ἐπήκοος) Ariæus spoke these *words*: "Clearchus, O Greeks, has his just punishment (δίκη) and is dead: for he was-found-to-be (φαίνω) a perjurer (participle) and a breaker-of treaties: but Proxenus and Meno are *held* in high honour because they reported (καταγγέλλω) his treachery. And

from you the king demands back your arms; for, he says, they are his, since they were those of Cyrus, his servant."

[N.B.—Omit the words in italics when translating.]

(*b*) Cyrus, having crossed the river, advanced two days' march, ten parasangs, to a large and wealthy city, where he remained six days.

(*c*) Death is common to the worst and to the best men.

(*d*) My father has given me the book which you gave him.

(*e*) Wise men learn many things from enemies.

(*f*) That is not the part either of a wise or a good man.

Latin.

SECTION III.

Question 1.—Give the perfect indicative and present infinitive of nolo, eo, fero, cædo, occido, cado, quæro, obliviscor, comminiscor, possum, prosum.

Question 2.—Give the genitive singular and dative plural of—caro, dos, mus, vellus, locus, palus, vulgus, civis, cinis, ŏs, and ōs. Name, in each case, the gender.

Question 3.—After what sort of verbs are quin and quominus used? Give examples.

Question 4.—When does quum take the subjunctive after it, and when the indicative? Mention any exceptions to the general rule.

Question 5.—What cases of the person and thing follow—damnare, circumdare, docere, adimere?

Greek.

SECTION III.

Question 1.—Give the first person singular of all the tenses of the indicative mood of ἵστημι and their meaning in English.

Question 2.—Give the first person singular of the future and second aorist indicative of the following verbs—λαμβάνω, λανθάνω, τυγχάνω, πυνθάνομαι, ἁλίσκομαι, γιγώσκω, εὑρίσκω, ἀποθνήσκω, πάσχω, γίγνομαι, ἔχω, δίδωμι.

Question 3.—With what moods and tenses is μὴ used in prohibitions? What is the difference in meaning?

Question 4.—Translate and explain the construction of—

οὐ μὴ ποιήσεις,

οὐ μὴ ποιήσῃς,

οὔτ' ἂν δυναίμην μήτ' ἐπίσταίμην λέγειν (ἐπίσταμαι=I know).

Question 5.—With what words in other languages are these etymologically connected? κύων, ὄγη, τως, οἶνος, ἔαρ, ἔπομαι.

German.

SECTION I.

1. Translate into English:—

(*a*) Und lasst mich nun auch sagen, dass ich tausendmal, ja beständig Eurer gedenke, in der Nähe der Gegenstände, die ich allein zu sehen niemals glaubte. Nur da ich jedermann mit Leib und Seele in Norden gefesselt, alle Aumuthung nach diesen Gegenden verschwunden sah, konnte ich mich entschliessen einen langen einsamen Weg zu machen, und den Mittelpunkt zu suchen, nach dem mich ein unwiderstehliches Bedürfniss hinzog. Ja die letzten Jahre wurde es eine Art von Krankheit, von der mich nur der Aublick und die Gegenwart heilen konnte.

(*b*) Wall.—Es ist zu spät: du weisst nicht was geschehn.
Max.—Und wär's zu spät—und wär' es auch so weit,
Dass ein Verbrechen nur vom Fall dich rettet,
So falle! falle würdig, wie du standst.
Verliere das Commando. Geh' vom Schauplatz.
Du kannst's mit Glanze, thu's mit Unschuld auch.
—Du hast für andre viel gelebt, leb' endlich
Einmal dir selber! Ich begleite dich,
Mein Schicksal trenn' ich nimmer von dem deinen—
Wall.—Es ist zu spät. Indem du deine Worte
Verlierst, ist schon ein Meilenzeiger nach dem andern
Zurückgelegt von meinen Eilenden,
Die mein Gebot nach Prag und Eger tragen.
—Ergib dich drein, wir handeln wie wir müssen.
So lass uns das Nothwendige mit Würde,
Mit festem Schritte thun—Was thu' ich Schlimmres
Als jener Cäsar that, dess Name noch
Bis heut das Höchste in der Welt benennet?
Er führte wider Rom die Legionen,
Die Rom ihm zur Beschützung anvertraut.
Warf er das Schwert von sich, er war verloren,
Wie ich es wär', wenn ich entwaffnete.
Ich spüre was in mir von seinem Geist,
Gib mir sein Glück! Das Andra will ich tragen.

2. Parse: Eurer — jedermann — Jahre—was geschehn—schlimmres—dess Name—warf.

French.

SECTION I.

1. Translate into English:—

Il en est des destinées comme des aurores: les unes se lèvent rayonnantes de mille lueurs, les autres noyées dans de sombres nuages. Celle de l'oncle Maurice fut de ces dernières. Il vint au monde si chétif qu'on le crut condamné à mourir: mais, malgré ces prévisions, que l'on pouvait appeler des espérances, il continua à vivre souffrant et contrefait. Son enfance, dépourvue de toutes les grâces, le fut également de toutes les joies. Opprimé à cause de sa faiblesse, raillé pour sa laideur, le petit bossu ouvrit en vain ses bras au monde le monde passa en le montrant au doigt. Cependant sa mère lui restait, et ce fut à elle que l'enfant reporta les élans d'un cœur repoussée. Heureux dans ce refuge, il atteignit l'âge où l'homme prend place dans la vie, et dut se contenter de celle qu'avaient dedaigné les autres. Son instruction eût pu lui ouvrir toutes les carrières: il devint buraliste d'une des petites maisons d'octroi qui gardaient l'entrés de sa ville natale!

2. Parse—le fut—atteignit—eût pu lui ouvrir. Comment on the following phrases—ce fut à elle que—qu'avaient dédaigné les autres.

3. Translate into English:—

(*a*) Un prêtre, environné d'une foule cruelle,
Portera sur ma fille une main criminelle,
Déchirera son sein, et d'un œil curieux,
Dans son cœur palpitant consultera les dieux!
Et moi, qui l'amenai triomphante, adorée,
Je m'en retournerai seule et désespérée!
Je verrai les chemins encore tout parfumés,
Des fleurs dont sous ses pas on les avait semés!
Non, je ne l'aurai point amenée au supplice,
Ou vous ferez aux Grecs un double sacrifice!
Ni crainte ni respect ne m'en peut détacher.
De mes bras tout sanglants il faudra l'arracher.
Aussi barbare époux qu'impitoyable père,
Venez si vous l'osez la ravir à sa mère.
Et vous, rentrez, ma fille, et du moins à mes lois
Obéissez encore pour la dernière fois.

Or (*b*) C'en est fait: je n'en puis plus, je me meurs, je suis mort, je suis enterré. N'y a-t-il personne qui veuille me resusciter, en me rendant mon cher argent, ou en m'apprenant qui l'a pris? Hé! que dites vous? Ce n'est personne. Il faut, qui que ce soit qui ait fait le coup, qu'avec beaucoup de soin ou ait épié l'heure: et l'on a choisi justement le temps que je parlais à mon traître de fils! Je veux aller quérir la justice, et faire donner la question à toute ma maison, à servantes, à valets, à fils, à fille, et à moi aussi. Que de gens assemblés! Je ne jette mes regards sur personne qui ne me donne des soupçons, et tout me semble mon voleur. Hé! de quoi est-ce on parle là? de celui qui m'a dérobé? Quel bruit fait on là-haut? est ce mon voleur qui y est? De grâce, si l'on sait des nouvelles de mon voleur, je supplie que l'on m'en dise.

German.

SECTION II.

Translate into German:—

This race-of-men did not take refuge in these islands for (zu) amusement: it was no caprice which drove the next comers (Folgende) to unite with them; necessity taught them to seek their safety in the most disadvantageous situation, and made them shrewd (klug) when the whole northern world still lay enslaved in gloom: their multiplication and wealth were a necessary result. Now their dwellings began-to-press (reflective) higher and higher: sand and marsh were replaced by rocks. The houses were forced to seek to gain in height what they lacked in breadth. Grudging (literally, niggardly-of) every span of soil, they allowed for streets no greater breadth than was needful to separate one row of houses from that standing opposite, and to keep scanty gangways for the citizens.

French.

SECTION II.

1. Translate into French:—

The carpenter looked at his wife and son with an air of-stupefaction (adj.): it was necessary to proceed (en venir) to explanations. The latter related how he had entered into negociations with Benoît, who as-the-price-of (pour) handing-over his business, had absolutely insisted on half the two thousand

francs down. It was in the hope of procuring this that he had taken-on (entrer) at a master contractor's at Versailles; there he had been able to experiment on his invention, and to find a purchaser. Thanks to the money received, he had just closed with Benoit; and he was bringing his father the key of the new workshop. This explanation of the young workman had been given with so much modesty and simplicity, that I was quite affected thereby.

German.

SECTION III.

1. How are separable and inseparable compound verbs distinguished? Give five instances, with the meanings attached.
2. Give a concise sketch of the character of Wallenstein as brought out in 'Wallenstein's Tod.'
3. Express in German: The longer the better. Go on writing. There is too much talking in Parliament. Get your coat mended. He died on his journey home. I like sweet wine. Christians must not hate one another. There are men who cannot bear (leiden) travelling. Three times twelve are thirty-six.

French.

SECTION III.

1. Give a rule for distinguishing between the present participle and the participial adjective; state, and illustrate by example, the difference of grammatical usage in the two cases.
2. 'Il marchait jusqu'à ce que la faim et la fatigue se fissent sentir:' explain the use of the substantive.
'La fièvre a été noyée absolument comme Poniatowski dans l'Elster.' Explain the allusion, and show its appropriateness.
'On regardait chez moi par les fentes, et l'on me calomniait.' Translate and explain. How is the metaphor contained in the word 'fentes' carried on by the speaker in the next line?
5. Express in French:—The girl to whom I lent the book has not returned it—It is you I am speaking to—The patient is going on better since we changed the medicine—He lived in a family by whom he was dearly loved—Be so-good-as to hold your tongue—I have had a fine bed-room built—A month ago she had not even seen him—As I passed the post, I asked for letters—The more you eat of it, the fatter you get (engraisser)—The old woman and her grandsons lost their way on the road to Paris.

FIRST YEAR.

FEMALE CANDIDATES.

Grammar and Composition.

Three hours allowed for this Paper.

Every Candidate *must* perform the exercise in Composition.

Composition.

Write a brief essay on *one* of the following subjects—
1. The four seasons of the year.
2. Rewards and punishments for children.
3. The characteristics of a good schoolmistress.

Grammar and Composition.

Lines on hearing a Thrush sing in a morning walk in January.

Sing on, sweet thrush, upon the leafless *bough*,
Sing on, sweet bird; I listen to thy *strain*;
See, aged *Winter*, 'mid his surly reign,
At thy blithe carol clears his *furrowed* brow.

So in lone Poverty's dominion drear,
Sits meek Content, with light, unanxious heart,
Welcomes the rapid moments, *bids* them part,
Nor asks *if* they bring aught to hope or *fear*.

I thank Thee, Author of this opening day,
Thou *whose* bright sun now gilds the orient skies!
Riches denied, Thy boon was purer *joys*,
What Wealth could never give nor *take* away.

BURNS.

1. Express in simple prose the above passage.
2. Analyse the passage, and parse the words in italics.
3. Make a list of the words which are not of Anglo-Saxon origin in the above passage, and give their derivations.
4. What information can you give about the author?

TO THE RAINBOW.

Triumphal arch, *that* fill'st the sky
When storms prepare to part,
I ask not proud Philosophy
To teach me *what* thou art.

Still *seem*, *as* in my childhood's sight,
A midway *station* given
For happy spirits to alight
Betwixt the earth and heaven.

Can all that optics teach, *unfold*
Thy form to please me *so*
As when I dreamt of gems and gold
Hid in thy radiant bow?

When Science from creation's face
Enchantment's *veil* withdraws,
What lovely visions yield their place
To cold material laws!—CAMPBELL.

1. Express in simple prose the above passage.
2. Parse the words in italics, and Analyse the first and third and fourth stanzas.
3. Give examples from the above, of— (*a*) personification, (*b*) antithesis, (*c*) inverted order.
4. What information can you give about the Author?

KING HENRY V.

So work the honey bees;
Creatures, that by a rule in nature *teach*
The act of order to a *peopled* kingdom.
They have a king and officers of sorts:
Where some, like magistrates, *correct* at home:
Others, like merchants, venture *trade* abroad:
Others, like *soldiers*, armèd in their stings,
Make boot upon the summer's velvet buds,
Which pillage they with merry march bring home
To the tent royal of their emperor;
Who, busied in his majesty, surveys
The singing masons building *roofs* of gold.
The civil *citizens* kneeding up the honey,
The poor mechanic porters *crowding in*
Their heavy burdens at his narrow gate.

SHAKSPERE.

1. Express in simple prose the above passage.
2. Parse the words in italics, and analyse the passage from "*They have a king*" down to "*roofs of gold.*"
3. Show what expressions in the above belong to an earlier date in our literature than the present.
4. What information can you give about the Author?

School Management.

Three hours allowed for this Paper.

No Candidate is permitted to answer more than *eight* questions. All who answer a sufficient number of questions for Infants, viz., those marked with an asterisk (*),—satisfactorily, *and who afterwards pass a satisfactory probation in Infant Schools*, will have a *special stamp* added to their Certificates when issued. Candidates for the special stamp for Infants *must* write "*for Infants*" at the heading of this paper.

N.B.—Question No. 1 (on Registers) MUST be answered by all Students who are proceeding to a school, and BY ALL ACTING TEACHERS, but should be omitted by Students who are remaining in the Training College for another year.

1. Distinguish between the average attendance of a school or class, and the average number of attendances made by each child, and show how each is found.

Give a specimen of a Class Attendance Register with ten names for one week, and show how the following particulars should be marked and calculated:—
(*a*) Presence and absence;
(*b*) School holiday;
(*c*) Leaving school before the expiration of two hours' secular instruction;
(*d*) Correction of previous mark;
(*e*) Percentage of absence for the week;
(*f*) Number of attendances;
(*g*) Average attendance.

2. Show how you would appropriate the school hours of one week to the several subjects of instruction in—

*(*a*) An Infant School composed wholly of children under 7; *or*,

(*b*) An Infant School including a First Standard; *or*,

(*c*) A Girls' School.

Are there any lessons or exercises which should be placed earlier in the day than others? Give reasons for your answer.

*3. In teaching very young children to read, is it better to begin with the alphabet or little words? Give your reasons.

4. Sketch the outline of a lesson on *one* of these subjects:—

(*a*) Gibraltar;
(*b*) Silver and its uses;
(*c*) Wheat;
*(*d*) A kitchen (*for an Infant class*).

*5. Give some examples of the sort of oral or mental exercise in Arithmetic suited for a class of beginners. Say what other visible illustrations, besides the ball-frame, would be useful in teaching to count.

6. What are the advantages and disadvantages of engraved head lines in copy books? When and how would you think it necessary to supplement them, by setting copies on the blackboard? Arrange the letters of the alphabet in the order of their difficulty, and show how you would group them together in your earliest writing lessons.

7. Give some rules for conducting a good dictation lesson, and for correcting the exercise expeditiously and thoroughly.

8. If you are called on as head teacher to select sets of reading books for Standards I. and II., how will you be guided in your selection, and what conditions ought such books to fulfil?

*9. What are the best means to be employed in order to make your scholars' reading expressive and intelligent? How far are *pattern-reading*, *simultaneous reading*, and *recitation*, respectively, likely to be useful to this end?

*10. Give a list of the object lessons which should be given in the course of three months to children of the First Standard. What is the general purpose which such lessons ought to serve, and what is the advantage of making such a list beforehand?

11. In what way can a plan of the school and its immediate surroundings serve as an elementary lesson on Geography? Draw such a plan, of any schoolroom you know; and show how it might be made useful in giving to children right notions of dimension and of distance.

*12. In what ways may a good teacher hope to influence the habits and the moral character of the children under her care? Refer especially to any means at her command for inculcating (1) Respect for parents, (2) The love of truth.

13. If a Penny Savings' Bank were attached to your school, in what way do you think you could properly promote its success; and by what other means could you encourage the habit of thrift among your scholars?

British History.

Three hours allowed for this Paper.

No Candidate is permitted to answer more than *eight* questions.

1. Describe the steps by which William the Conqueror established his dominion in England.

2. Give some account of the circumstances which brought England and Scotland in contact during the reign of Stephen.

3. In whose reigns did the Crusades occur? Give a summary of events in England during the third crusade.

4. What were the occasions and grounds of dispute during the reign of Henry III. between (*a*) England and Wales, (*b*) England and Scotland, (*c*) England and France? What were the results?

5. Describe the relations that existed between Edward II. and the Barons, and state fully the course and consequences of the second revolt.

6. Give an account of the campaign in which the Battle of Poitiers was fought, with dates; and state the political results that followed.

7. Who were the Lollards? In what reigns do we hear most about them? Give their origin, some of their chief doctrines, and the reception they met with.

8. What circumstances gave importance to the Battles of Homildon Hill and Shrewsbury in the reign of Henry IV.?

9. On the accession of Henry VI., what arrangements were made for the government of the kingdom? State briefly the part taken by the principal officers, and the result at the close of the French War.

10. What steps were taken by the English Sovereigns to incorporate Ireland into their dominions?

11. State the obstacles to his throne encountered by Henry VII., and how far he overcame them.

12. What progress did the Reformation make in the reign of Henry VIII.?

13. Explain the claim of Lady Jane Grey to the Throne of England, the manner in which it was promoted, and the results to those engaged in forwarding it.

14. Mention the most celebrated of the English Navigators, and give some account of their voyages.

15. Give a sketch of the social condition of England during the Tudor Period.

Geography.

Three hours allowed for this Paper.

No Candidate is permitted to answer more than *eight* questions; or draw more than one map, in addition to the *diagram* (Question 2).

1. Give the proofs of the earth's roundness most likely to be intelligible to children in Standard II., and illustrate them very clearly.

2. Explain the meaning of the terms:—Zone, Meridian, Equator, Parallel of Latitude: illustrating your explanations by a diagram.

3. What explanations would you give to a child who asked you the cause (*a*) of the drops of water on the inside of the cover of a dish of hot potatoes; (*b*) of the moisture on a window-pane in cold weather; (*c*) of the similarity between the steam from an engine and the clouds; and (*d*) why all the water in a saucepan disappears if the latter be left too long on the fire?

4. Assign the following animals and plants to their proper zones:—

Hippopotamus, Giraffe, Buffalo, Beaver, White Bear, Wolf, Reindeer; Cinnamon, Date Palm, Indigo, Olive, Strawberry.

5. Name, in their order from north to south, the chief capes, islands, towns, and openings, with the rivers (if any), flowing into them,—on the west coast of Ireland.

6. Name the chief agricultural and other products of Ireland. State from what ports in that country, to what ports in England, respectively, they are sent.

7. Where are the Highlands of Scotland said to begin? Name the three largest Highland and the three largest Lowland Counties. Compare the physical features, population, and productions of the Highlands with those of the Lowlands.

8. Describe briefly a voyage along the east of Scotland from Fife Ness to Tarbet Ness, mentioning anything of interest that you know respecting the places you would pass.

9. What is a coal-field? Describe that situated in Staffordshire, with its chief industries and their centres.

10. Name, in the order of size, the principal seaports in the United Kingdom, their situations, and their chief objects of trade, respectively.

11. In what parts of the British Isles are the following articles chiefly produced:—Cider, hops, cheese, hams, soda, boots and shoes, gloves, ribbons, woollen cloth, straw hats, shawls, linen, lace?

12. What and where are Barra, Pomona, Bandon, Valentia, Glendalough, Exmoor, Taunton, Portrush, Ulleswater, Saddleback, Ingleborough, McGillicuddy's Reeks, the Minch, the Solent, the Wash, the Naze, the Nore, the Lizard, the Eddystone?

13. Draw a map of the coast from the Land's End to Holyhead; or from Spurn-head to the South Foreland.

14. Draw a map of the coast-line of Scotland from Cape Wrath to Kinnaird Head; *or*, from the latter to the Port of Leith—marking, in each case, the river-mouths and names of counties.

15. Draw a map of the South Coast of Ireland between Carnsore Point and Cape Clear, giving the chief openings and seaports.

Arithmetic.

Two hours and a half allowed for this Paper.

No Candidate is permitted to answer more than *ten* questions.

The solution must be given at such length as to be intelligible to the Examiner, otherwise the answer will be considered of no value.

1. Add together one hundred and seven thousand and eleven, ten thousand one hundred and six, five hundred and ninety thousand and twenty, two hundred and fifty-nine thousand seven hundred and seven;—Multiply the sum of those numbers by three hundred and ninety-eight and divide the product by seven hundred and twenty-six. Give the sum, product, and quotient in words as well as in figures.

2. Take 8 acres, 3 roods, 17 poles, 3¼ yards, from ten acres, and multiply the remainder by 85.

3. Make out the following bill:—29½ yards of flannel, at 3s. 4d. per yard, 37 yards of calico, at 5½d. per yard, 112 yards of calico, at 6¼d. per yard, 29 yards of cloth, at 1s. 4½d. per yard, 17½ dozen pairs of socks, at 18s. 6d. per dozen—Deduct 2d. in the shilling for discount, and receipt the bill.

4. Find by practice the value of 1,704 articles at £7 1s. 6¾d. each. *Or*, the cost of 69 cwt., 1 qr., 21 lbs., at £3 17s. 8d. per cwt.

5. A bankrupt's debts amount to £5,856, but his assets are sufficient to pay 18s. 11¼d. in the £. What will be lost by a creditor to whom one quarter of the bankrupt's debts are owing?

6. If the charge for digging a pit 30 feet long, 18 feet 6 inches wide, and 8 feet 9 inches deep be £50 10s., how much more would it cost to make it 5 feet longer and 9 inches deeper?

7. I walked a tour of 377·0139375 miles at a uniform rate of 4·3075 miles per hour. How many hours did my journey take?

8. Find the value of £3,808 3s. 3¾d. × (1⅔ of 8¾ ÷ 1⅛ of ⅔).

9. At a concert $\frac{1}{16}$ of the audience paid 10s. each for their seats, ⅛ paid 5s., $\frac{1}{12}$ paid 2s. 6d., ⅔ paid 1s., ¼ paid 6d., and the remaining 38 were let in free. How many attended the concert and what amount of money was taken?

10. In what time will £989 10s. amount to £1,189 13s. 3½d., at 4½ per cent. per annum, simple interest?

11. A man buys a farm of 150 acres for £4,624, and after repairing the buildings, etc., lets it at 30s. per acre, thereby getting a return of 4½ per cent. for his money. What sum did he spend in repairs.

12. A dealer lost a sum equivalent to 9½ per cent. on the sale of goods which cost him £3 9s. 2d., but gained a sum equal to 9½ per cent. on a lot which cost him £7 10s. How much per cent. had he gained or lost at the end of both transactions?

13. Explain, as you would to children, and illustrate by examples, what is meant by (*a*) *A Decimal*, (*b*) *A Factor*, (*c*) *Percentage*, (*d*) *Discount*, (*e*) *The rule of Three by "the method of unity"* or *"first principles."*

Domestic Economy.

Three hours allowed for this Paper.

No Candidate is permitted to answer more than *eight* questions.

1. Into what classes may foodstuffs be divided? Give examples of each.

2. How may pure freshly-ground flour be known? Explain why bread made from the whole meal is more nutritious than white bread.

3. In what way may dripping be used as a substitute for butter in the families of the poor?

4. Give directions to a first class for setting in a patch, stating your reasons for each step in the process.

5. What are the relative advantages of wool, cotton, and linen for clothing (*a*) with regard to health; (*b*) with regard to cost?

6. How should a child's frock be cut out? Illustrate your answer by diagrams, and state the quantity of material required for a child eight years old.

7. Give receipts for a meat pudding, a light pudding for invalids, and a meat soup.

8. What are the preparations that should be made for washing day? In what order should the clothes be washed, and state why some should be boiled and some not.

9. Describe any machines you may be acquainted with for lessening the labour in washing; their advantages, and the objections sometimes made to them.

10. What is starch? How is it manufactured, and how prepared for use?

11. Write notes for a first class on clothing.

12. Describe generally, as to a Fourth Standard, the processes by which *one* of the following is prepared for clothing: skins of animals, cotton, flax, silk in the cocoon.

(To be continued.)

JARROLDS' 'EMPIRE' READERS

By S. B. TAIT, Author of 'Home Lesson Books,' &c.

SERIES NOW COMPLETE.

Meeting most of the Suggestions of H.M. Inspectors, as presented in their recent Reports.

PRIMER, Part I., 32 pp., 24 Illustrations, 2d.; cloth, 3d.
" " II., 32 " 17 " 2d.; " 3d.
" Complete, cloth, very strongly bound, 64 pp., 41 Illustrations ... ... 4d.
Book IA, large type, cloth, 96 pp., 19 Illustrations, 6d.
" IB, smaller " " 96 " 23 " 6d.
Book II., cloth, 128 pp., 27 Illustrations 8d.
" III., " 160 " 18 " ... 10d.
" IV., " 192 " 25 " ... 1s.
" V., " 224 " 29 " ... 1s. 3d.
" VI.,* " 288 " 30 " ... 1s. 6d.
* For 6th and 7th Standards.

The PRIMER LESSONS are also issued in large Sheets (size 24 by 19 inches), entitled **THE EMPIRE READING SHEETS**. FIRST and SECOND Series (corresponding with the first and second parts of the Primer) in ornamental wrapper, and strongly mounted on gilt moulding, price 3s. 6d. each series; on 18 thick millboards, 25s. each series; and on 9 millboards (back and front), 14s. each series.

In addition to very strong and attractive bindings the following may be regarded as the **distinguishing feature** of the series:—

(1) **The difficulties of beginners are reduced to a minimum** by (*a*) the use of **large, bold type** in the earlier books; (*b*) **Confining the scholars' attention at first to** words in which **similar sounds are represented by similar** combinations of **letters**.
(2) **A careful graduation** of the lessons, ensuring a steady and even progress.
(3) **The large number of conversational lessons**, which will serve to produce natural and easy reading in place of monotonous drawling.
(4) Remembering that it is impossible for children to read well what they do not understand, **reading lessons** have been selected which are **interesting** in themselves, **and within the range of children's comprehension**; at the same time, the **pieces** have been taken **from recognised authors**.

The Publishers will be happy to forward a book of Specimen pages, reviews, recommendations, etc., POST FREE on application.

London: JARROLD & SONS, 3, Paternoster Buildings.

THE
SCHOOL OF ART
Drawing Copy-Books.

NOW READY,
GEOMETRY, Book I.
Price 3d.

Containing Definitions, First Grade Problems, Tests, and Geometrical Figures for Copying.

Recently Published.

FREEHAND. By Rev. C. G. BROWN, B.A., Principal of Carmarthen Training College. In Six Books. Price 3d. each.

PERSPECTIVE. By Rev. HENRY LEWIS, M.A., Principal of Culham Training College. In Six Books. Price 4d. each.

☞ *Specimens Free to Teachers of Drawing.*

JOHN WALKER & Co., 96, Farringdon Street, London, E.C.

The International Microscope
(£3 3s.).

Every Teacher should try one.

Notice the Terms. May be returned if not approved within 10 days.

WONDERFULLY CHEAP!

THE INTERNATIONAL MICROSCOPE, with Brass Stand; Coarse and Fine Adjustment; Draw-tube; Sliding-Plate to Stage, which admits of objects being moved in any direction; Diaphragm; one Eye-piece; Concave Mirror; Dividing Object-glass, ¼, ⅛, and 1-in., in Brass Box, when divided forming three different powers: Live Box, for examining fluids or Live Objects; and Brass Hand and Stage Forceps—the whole, enclosed in a Polished Mahogany Case with Lock and Fittings.

Price £3 3s.

TESTIMONIAL. G. G. Esq., Northumberland, writes: 'The instrument I got from you in March last has given great satisfaction, and is, I think, a first-rate article. Our doctor, who came in one day when it was being used, was much pleased with it also.

P.O. Orders Payable to J. HALL, MANAGER.

The Scientific Instrument Agency,
50, Chancery Lane, London, W.C.

DARLOW'S MAGNETINE.

DARLOW & CO.'S MAGNETINE APPLIANCES are used and recommended for the Cure of Gout and Rheumatism, Spinal, Liver, Kidney, Lung, Throat, and Chest Complaints, General Debility, Indigestion, Hernia, Sciatica, Neuralgia, Bronchitis, and other forms of Nervous and Rheumatic Affections.

From GARTH WILKINSON, Esq., M.D., M.R.C.S.E.

70, Wimpole Street, London, W.

F. W. Darlow, Esq.

SIR,—I am able to certify that I have used your Magnetine Appliances pretty largely in my practice, and that in personal convenience to my patients they are unexceptionable, and far superior to any invention of the kind which I have employed; and that of their efficacy, their positive powers I have no doubt. I have found them useful in constipation, in abdominal congestion, in neuralgia, and in many cases involving weakness of the spine, and of the great organs of the abdomen. In the public interest I wish you to use my unqualified testimony in favour of your Magnetic Appliances.—I remain, yours faithfully,

GARTH WILKINSON, M.D., M.R.C.S.E.

DARLOW'S BELTS.
DARLOW'S CHEST PROTECTORS.
DARLOW'S LUNG PROTECTORS.
DARLOW'S SPINE BANDS.
DARLOW'S KNEE CAPS.
DARLOW'S WRISTLETS.

DESCRIPTIVE PAMPHLET POST FREE.

LONDON:
DARLOW & CO., 443, STRAND

SCHOLASTIC MUSICAL INSTRUMENT CO.
(ESTABLISHED 1871).

To supply Teachers, School Board Members, and School Managers with ANY kind of Musical Instrument from ANY Maker at bona fide Trade Price for Cash, or by Easy Instalments.

Every one should read our Circular and Extracts, which are sent Post free.

Apply to the MANAGER, 39 Oseney Crescent, Camden Road, N.W.

'We have now had plenty of time to try the piano; and I can say to you how very much we are pleased with it, and how greatly I am obliged to you for procuring me so excellent an instrument so cheap.'—MATTHEW ARNOLD, Esq., H.M.I.

'You are at liberty to make any use of my wife's and my own opinion—that the piano is excellent both for tone and touch, and that it is a very cheap piano.'—Rev. T. W. SHARPE, M.A., *H.M.I. for Training College for Schoolmasters.*

15,000 similar Testimonials have been received from all parts of the country, from H.M. Inspectors, Assistant Inspectors, Presidents of N.U.E.T., Principals and Masters of Training Colleges, Teachers and School Board Clerks.

THE ONLY ADDRESS IS
39 OSENEY CRESCENT, CAMDEN ROAD, LONDON, N.W.

CIVIL SERVICE APPOINTMENTS.

Clerkships, Excise, Customs, etc. Candidates rapidly prepared through the post.—J. KEEFE, F.S.A., etc., Civil Service Academy, 6, Colquitt Street, Liverpool.

ADAIR'S
EXCELSIOR COPY-BOOKS.

Acknowledged to be the most beautiful style of Writing of any Copy-books in the Market.

Fcap. 4to, 16 pp. . . . 1d. each.
" 24 pp. . . . . 2d "

The Series consists of nine numbers, carefully graduated on the most skilful principle to facilitate the easy progress of the Pupils.

1. Introductory - Letters — Easy Words, without Long Letters. Double Line.
2. Easy Words, with Long Letters. Double Line.
3. Easy Words and Long Letters. Double Line.
4. Capitals—Words with Capitals—Figures. Double Line.
5. Short Sentences, With Capitals. Double Line.
6. Small Hand—Sentences. Double Line.
7. Small Hand—Sentences.
8. General Finishing Hand.
9. Commercial Finishing Hand.

A Invoice and Account Forms.
B Letters and Commercial Forms

Books A and B are in course of preparation, and will be ready shortly.

The Writing is natural, elegant, and free—the fac-similes of the writing of a Teacher who has made the teaching of writing a special study for upwards of thirty-six years, and is acknowledged by H.M.I. as one of the most successful writing masters of the day.

'The writer and engraver put their whole trust in the graceful, attractive, clear, and easy style of caligraphy. It is certainly an exceedingly desirable style for school children to acquire, and it has the merit of being really adapted to pen-and-ink work, and not merely a good piece of engraving to look at.'—*The School Board Chronicle, London.*

'This series of copy-books extends from Letters to "Commercial Finishing Hand." It is skilfully graduated, and presents the very best models of writing. The combinations of letters given for imitation in the earlier numbers are specially fitted to train both the eye and the hand to the niceties of correct penmanship; and pupils carefully drilled to the faithful copying of the various head-lines must in time acquire a very good style of writing. We can highly recommend the series to teachers in search of copy-books.'—*The Educational News.*

London: GEORGE GILL & SONS, 23, Warwick Lane, Paternoster Row.
Manchester: THE MANCHESTER AND DISTRICT SCHOLASTIC TRADING COMPANY, 43, Deansgate.
Liverpool: THE NORTH-WESTERN EDUCATIONAL TRADING CO., Limited, 44a, Renshaw Street.
Belfast: HUGH ADAIR, Publisher.

HARRISON'S
CORALINE EYE-SHIELDS,

ANATOMICALLY ADJUSTED

A complete and perfect Reading Shade, light as a feather pretty as a coral ornament. Sold by all Opticians, Chemists, etc., and sent post free as under:—

Fitted with Elastic Attachment .. .. 2s.
" " Fine Steel Riding Bows .. 4s.

HARRISON & SON, Opticians,
40, HATTON GARDEN, LONDON, E.C.

ESTABLISHED 1851.

BIRKBECK BANK.—Southampton Buildings, Chancery Lane.

Current Accounts opened according to the usual practice of other Bankers, and Interest allowed on the minimum monthly balances when not drawn below £25. No commission charged for keeping Accounts.

The Bank also receives money on Deposit at Three per cent. Interest.

The Bank undertakes for its Customers, free of charge, the custody of Deeds, Writings, and other Securities and Valuables; the collection of Bills of Exchange, Dividends, and Coupons; and the purchase and sale of Stocks and Shares. Letters of Credit and Circular Notes issued.

A Pamphlet, with full particulars, on application.

31st March, 1880. FRANCIS RAVENSCROFT, Manager.

The Birkbeck Building Society's Annual Receipts exceed Four Millions.

HOW TO PURCHASE A HOUSE FOR TWO GUINEAS PER MONTH, with immediate Possession and no Rent to Pay. Apply at the Office of the BIRKBECK BUILDING SOCIETY.

HOW TO PURCHASE A PLOT OF LAND FOR FIVE SHILLINGS PER MONTH, with immediate possession, either for Building or Gardening purposes. Apply at the Office of the BIRKBECK FREEHOLD LAND SOCIETY.

A Pamphlet, with all particulars, on application.

FRANCIS RAVENSCROFT, Manager.
Southampton Buildings, Chancery Lane.

'BANKRUPT STOCK.'

G. E. HAWES,

SCHOOL DESK MANUFACTURER,

Having purchased the Entire Stock of Iron Standards manufactured by

JOHN GLENDENNING,

Late of Chalk Hill Works, trading under the name of

COLMAN & GLENDENNING,

IS NOW OFFERING THE CELEBRATED

NORWICH DESKS

AT GREATLY REDUCED PRICES.

For particulars apply to the above, at

CHAPEL FIELD
OR
DUKE'S PALACE WORKS,
NORWICH.

Maker to the Birmingham School Board.

DR. HOPKINS'S EDUCATIONAL WORKS.

HOPKINS'S EXERCISES IN ORTHOGRAPHY, on an improved plan, and containing much valuable information on various subjects. New Edition, 1s. 6d.

HOPKINS'S EXERCISES IN COMPOSITION. New Edition, 1s. 6d. A KEY TO THE ABOVE, 1s 6d.

HOPKINS'S PUPIL'S MANUAL OF EXERCISES IN MENTAL ARITHMETIC, containing 25,000 Questions, with the Rules for their Calculation, 2s.

HOPKINS'S TEACHERS' MANUAL OF EXERCISES IN MENTAL ARITHMETIC, forming a Key to the above 3s. 6d.

Simpkin, Marshall & Co., London; E. C. Osborne Birmingham.

IF YOU WANT a really good Steel Pen, ask your Stationer, or send 1/2 in Stamps for a sample box containing 6 dozen of

PERRY PENS

STEEL, Nickel, and Gilt, of assorted patterns, in a metal box. Sold by all Stationers. Wholesale,

HOLBORN VIADUCT, LONDON.

DRAWING & PAINTING MATERIALS.

Liberal Allowance to Schools. Send for Illustrated Catalogue, Post Free.

BRODIE & MIDDLETON,
79, LONG ACRE, LONDON.

Pp. 112, with 174 Diagrams, crown 8vo, price 2s. 6d.

LESSONS on FORM for the use of Teachers and Pupils in Elementary Schools. By RICHARD P. WRIGHT Teacher of Mathematics in University College School, London. Author of 'Elements of Plane Geometry.'

London, LONGMANS & CO.

PROFESSOR BAIN'S COURSE of ENGLISH for both Primary and Higher Schools; Revised Editions:—

	s.	d.
First English Grammar	1	4
Key, with Additional Exercises	1	9
Higher English Grammar	2	6
Companion to the Higher Grammar	3	6
English Composition and Rhetoric	4	0

London: LONGMANS & CO.

THE

SCHOLASTIC SEWING MACHINE COMPANY.

SPECIAL REDUCTION till April 15th, 1882.

A first-class £4 4s. Hand Lockstitch Machine, complete, and instruction-book, for £2 16s. cash, or by three quarterly instalments of £1 1s. each. Carriage paid. One month's free trial. Money returned if not satisfactory.

ABSTRACTS.

'The Bradbury machine I bought from you has been in use 12 months. It gives every satisfaction. I have recommended it for quality and cheapness. If all are as good as the one I purchased, your business will rapidly increase.'—Mr. E. CRADDOCK, St. Stephen's School, Barbourne, Worcester.

'The machines (Bradbury) have worked well, and quite given satisfaction.'—The Dowager Lady G. CRAIG, Dean's Court, Wimborne, Dorset.

'My wife has thoroughly tested the machine (Bradbury), and I am happy to bear testimony to its excellence. I am happy to recommend it as a thoroughly good and cheap machine.'—Mr. A. SIMMONS, The Schools, Weobley, Hereford.

Particulars, Testimonials, etc., from THE MANAGER, 155, White Horse Street, Stepney, London, E.

Small Crown 8vo, 368 pages, price 3s. 6d.

THE

HISTORICAL SCHOOL GEOGRAPHY.

BY

CHARLES MORRISON, M.A., Ph.D.,

Late Principal of Arnold College, Hackney.

Author of the 'Order of Creation,' etc.

LONDON: SIMPKIN, MARSHALL, & CO.

Just Published, Price 3d.

STANDARD GRAMMAR, BOOK IV.

Adapted to Standards V. VI. VII.

By PROFESSOR MEIKLEJOHN.

Nearly Ready, Price 1s. 3d.

STANDARD GRAMMAR.

BY PROFESSOR MEIKLEJOHN.

In One Volume, cloth.

Also in separate Parts—

BOOK	I.	for Standard	II., with 100 Exercises.....	2d.
,,	II.	,,	III., with 100 Exercises.....	3d.
,,	III.	,,	IV., with 90 Exercises.....	3d.
,,	IV.	,,	V. VI. VII., with 67 Ex...	3d.

W. & R. CHAMBERS, LONDON AND EDINBURGH.

SECOND EDITION. 'A gem of a little book.' 'Really unique.'

DICKINSON'S

DIFFICULTIES of English Grammar and Analysis Simplified.

WITH A COURSE OF EXAMINATION QUESTIONS.

Price 2s.

The Teachers' Assistant says:—'We are glad to welcome a second edition of Mr. Dickinson's useful little work. The whole subject is most fully and carefully treated from the first lesson on nouns to the examination of the most involved sentence. All knotty points are so thoroughly explained, and so fully illustrated, that it must be the student's own fault if he has not, after having worked through the book, an accurate and reliable grasp of the grammatical structure of the language.'

Sent Post Free for 1s. 6d. in Stamps.

London: JOSEPH HUGHES, Pilgrim St., Ludgate Hill, E.C.

SONGS FOR SCHOOL AND HOME. By RICHARD TISSINGTON. Cheap Edition, 48 Songs, complete, post free, 18 stamps. These favourite copyright Songs are incomparably the best collection published. They have been adopted in almost every School, and now form the special feature at Public and Private Entertainments everywhere.

BOB-O-LINK BALLADS. By RICHARD TISSINGTON. Cheap Edition, post free, 12 stamps. A new Book of Homely, Witty, and Humorous Readings and Recitations, specially suited for the present season.

BANKS & ASHWELL, 10, Wells Street, Oxford Street, London, W.

REV. A. M. WILCOX., M.A., Cambridge (Classical Honours), teaches Latin and Greek by correspondence, at moderate terms. Intelligent beginners will soon read Cæsar or Greek Testament.—Kington, Herefordshire.

NOW READY, PRICE 3s.

A Handbook of School Management and Methods of Teaching.

SEVENTH EDITION ENLARGED (28th Thousand)

BY

P. W. JOYCE, LL.D.,

ONE OF THE PROFESSORS IN THE TRAINING DEPARTMENT OF THE COMMISSIONERS OF NATIONAL EDUCATION, IRELAND.

DUBLIN: SULLIVAN BROTHERS;
LONDON: SIMPKIN, MARSHALL, & Co.;
EDINBURGH: JOHN MENZIES & Co.

JUST PUBLISHED.

BOTANY FOR SCHOOLS AND SCIENCE CLASSES.

Embracing the Structure, Classification, and Description of Plants.

BY

W. J. BROWNE, M.A.

NEW EDITION REVISED AND ENLARGED.

Foolscap 8vo, cloth, 112 pages, with 92 illustrations.

PRICE ONE SHILLING.

*** *Sanctioned by the Commissioners of National Education in Ireland.*

Dublin: SULLIVAN, BROTHERS;
London: SIMPKIN, MARSHALL, & Co.

PHILIPS' STANDARD SCHOOL ATLASES.

PHILIPS' COMPREHENSIVE ATLAS of ANCIENT and MODERN GEOGRAPHY. Containing 60 Maps (42 Modern and 18 Ancient), with Index. New Edition, revised and enlarged. Imperial 8vo, strongly half-bound, 10s. 6d.

PHILIPS' STUDENT'S ATLAS. Containing 48 Maps (43 Modern and 5 Ancient), with Index. New Edition, revised and enlarged. Imperial 8vo, cloth, 7s. 6d.

PHILIPS' SELECT ATLAS. Containing 36 Maps, with Index. New Edition, revised and enlarged. Imperial 8vo, cloth, 5s.

PHILIPS' INTRODUCTORY ATLAS. Containing 24 Coloured Maps, with Index. New Edition, revised and enlarged. Imperial 8vo, cloth, 3s. 6d.

PHILIPS' ATLAS for BEGINNERS. Containing 32 Maps. New and Improved Edition, with Index on a new plan. Crown 4to, cloth, 2s. 6d.

PHILIPS' SCHOOL ATLAS of PHYSICAL GEOGRAPHY. A Series of 20 Maps and Diagrams, with descriptive notices. New and Revised Edition. Imperial 8vo, cloth, 5s.

PHILIPS' SCHOOL ATLAS of CLASSICAL GEOGRAPHY. A Series of 18 Maps, printed in Colours, with Index, in which are given the Modern as well as the Ancient Names of Places. New and cheaper Edition. Medium 4to, cloth, 3s. 6d.

PHILIPS' HANDY CLASSICAL ATLAS, containing 18 Maps. Medium 8vo, cloth, 2s. 6d.

PHILIPS' GEOGRAPHICAL CLASS BOOKS.

CLASS-BOOK of MODERN GEOGRAPHY, with Examination Questions. By WILLIAM HUGHES, F.R.G.S. New Edition, revised and enlarged. By J. FRANCON WILLIAMS, F.R.G.S. Crown 8vo, cloth, 3s. 6d.

☞ **In the present edition the information throughout has been thoroughly Revised and considerably Extended. Every recent Discovery and Political Change is carefully noticed.**

'There is no reason why the work before us should not take its place among the first, if not of itself the first, of geographical class-books.'—*Practical Teacher.*

'The new edition by Mr. Williams brings it up accurately to the present state of our knowledge. Admirably adapted for our higher schools.'—DR. MILLER, *Perth.*

'A work which, for clearness, fulness, and excellence of arrangement, can hardly be surpassed.'—*Literary World.*

'I know no text-book on the same subject that can be compared to it.'—T. W. WALLACE, Esq., *High School, Inverness.*

ELEMENTARY CLASS-BOOK of MODERN GEOGRAPHY. By WILLIAM HUGHES, F.R.G.S. This volume is abridged from the larger class-book, and is designed for the use of less advanced pupils. New Edition, revised and enlarged. By J. FRANCON WILLIAMS, F.R.G.S. Foolscap 8vo, 1s. 6d.

OUTLINES of GEOGRAPHY, for Schools and Colleges. By W. LAWSON, St. Mark's College, Chelsea. New Edition, entirely re-written and extended. Foolscap 8vo, cloth, 3s. 6d.

GEOGRAPHY of the BRITISH COLONIES and FOREIGN POSSESSIONS, for the use of Candidates preparing for Examination. By the Rev. JOHN P. FAUNTHORPE, M.A., F.R.G.S., Principal of Whitelands College, Chelsea. Fourth Edition, revised and enlarged. Crown 8vo, cloth, 2s. 6d.

'Nothing seems to be lacking to entitle it to be described as a complete manual of instruction on our colonial possessions.—*The Schoolmaster.*

MANUAL of BRITISH HISTORICAL GEO-GRAPHY, containing the important events occurring at every site of English History. By W. J. C. CRAWLEY. Foolscap 8vo, cloth, 2s.

CLASS-BOOK of PHYSICAL GEOGRAPHY, with numerous Diagrams, and Examination Questions. By WILLIAM HUGHES, F.R.G.S. New Edition, entirely re-written and extended. *In the Press.*

ELEMENTARY CLASS-BOOK of PHYSICAL GEOGRAPHY, with Diagrams. By WILLIAM HUGHES, F.R.G.S. Designed for the use of the Middle and Lower Forms of Public Schools and Colleges. Foolscap 8vo, cloth, 1s.

THE GEOGRAPHY of RIVER SYSTEMS. By W. LAWSON, St. Mark's College, Chelsea. New and revised Edition. Foolscap 8vo, cloth, 1s.

THE GEOGRAPHY of COAST LINES. By W. LAWSON, St. Mark's College, Chelsea. New and revised Edition. Foolscap 8vo, cloth, 1s.

THE GEOGRAPHY of the OCEANS, Physical, Historical, and Descriptive. With Contour Map of the Ocean, Maps of the Atlantic, Pacific, Indian, Arctic, and Antarctic Oceans; Charts of Co-tides and Currents, etc., etc. By J. FRANCON WILLIAMS, F.R.G.S. Expressly prepared for the use of Candidates for Examinations. Foolscap 8vo, cloth, 2s. 6d.

'An admirable work. We know nothing better, whether for the school-room or the advanced student.'—*Educational News.*

'The best arranged and best written work of the kind which we can remember to have seen for a considerable period.'—*Shipping and Mercantile Gazette.*

PHILIPS' SCRIPTURE MANUALS.

BY THE REV. H. LINTON, M.A.

	s.	d.
The Book of Genesis, with Map	2	0
The Book of Jeremiah (Historical Chapters), with Map	2	0
The Book of Nehemiah, with Plan of Jerusalem	1	6
The First Epistle to the Corinthians, with Map	1	6
The Second Epistle to the Corinthians	*In the Press.*	

BY THE LATE JAMES DAVIES.

	s.	d.
Notes on Genesis	1	0
Notes on Exodus	1	0
Notes on Joshua	1	0
Notes on Judges	1	0
Notes on I. Samuel	1	0
Notes on II. Samuel	1	6
Notes on I. Kings	1	6
Notes on II. Kings	1	6
Notes on Ezra	1	0
Notes on St. Matthew's Gospel	2	0
Notes on St. Mark's Gospel	1	0
Notes on St. Luke's Gospel	1	6
Notes on St. John's Gospel	2	6
Notes on the Acts of the Apostles	1	6
Manual of the Church Catechism	1	0
Manual of the Book of Common Prayer	2	0

PHILIPS' HISTORICAL MANUALS.

MANUALS OF THE HISTORY OF ENGLAND.

	s.	d.
1.—From the death of Edward the Confessor to the death of King John (1066—1216)	2	0
2.—From the accession of Henry III. to the death of Richard III. (1216—1485)	2	0
3.—The Tudor Period (1485—1603)	2	0
4.—The Stuart Period (1603—1689)	1	6
5.—From the reign of Charles I. to the end of the Commonwealth (1640—1660)	1	6
6.—From the Restoration of Charles II. to the Revolution (1660—1688)	2	0
7.—From the accession of James I. to the Battle of the Boyne (1603—1690)	2	0
8.—From the Revolution of 1688 to the death of Queen Anne, 1714	1	6
9.—From the accession of William III. to the accession of George III. (1689—1760)	3	6
10.—From the accession of George III. to the Battle of Waterloo (1760—1815)	2	6
11.—Manual of English Literature from (1760—1815)	2	0

NOTE.—*Nos. 3 and 4 also embrace the* LITERATURE *of the Tudor and Stuart Periods respectively.*

APPROVED EDUCATIONAL WORKS.

BY J. C. CURTIS, B.A.,

Principal of the Training College, Borough Road, London, and one of the Examiners in History in the College of Preceptors.

*** Mr. Curtis will supply Principals of Schools with Specimen Copies at half the price in stamps.

The Poetical Reader. 116th Thousand. Price 1s.
'Just such a selection of spirited, genuine, and accredited ballads and pieces as we should wish our children to have at their tongues' end.'—*Patriot.*

The New Poetical Reader. 24th Thousand. Price 1s.
'It is sure to be a favourite wherever introduced.'—*National Schoolmaster.*

The Complete Poetical Reader. Being the Poetical Reader and the New Poetical Reader in one volume. Extra cloth, gilt lettered. Price 2s.

An English Grammar for Schools. With Copious Exercises, Examples of Parsing, Analysis, etc. 13th Thousand. Price 1s.
'Clear, sound, and compact.'—*School Board Chronicle.*

A First Book of Grammar and Analysis. With Copious Exercises and Questions for Examination. 42nd Thousand. Price 3d.
'A handy and thoroughly well got-up little manual.'—*Scholastic Register.*

Outlines of English Grammar. With Copious Exercises. 191st Thousand. Price 6d.
'Remarkably clear in its definitions, copious in its facts, and rich in the examples it gives for exercise.'—*Freeman.*

A Manual of Grammatical Analysis. With Copious Exercises for Analysis and Composition. 59th Thousand. Price 6d.
'A very clear and excellent manual.'—*School Board Chronicle.*

A Manual of Etymology. 17th Thousand. Price 6d.
'Ably executed. The notes are especially valuable.'—*Educational Review.*

Outlines of Geography. 150th Thousand. Price 6d.
'A most excellent little manual.'—*Court Circular.*

A First Book of Geography, with Questions for Examination. 11th Thousand. Price 3d.
'The amount of information is really wonderful.'—*National Schoolmaster.*

The Geography of Great Britain and Ireland. 15th Thousand. Price 6d.

A School and College History of England, containing Copious Supplementary Chapters. 24th Thousand. Price 5s. 6d.
'A most admirable general narrative is given of political events.'—*Civil Service Gazette.*

A Short Manual of English History. 9th Thousand. Price 6d.
'Comprehensive and well arranged.'—*Educational Record.*

Outlines of English History. 212th Thousand. Price 6d.

Outlines of Scripture History. 38th Thousand. Price 6d.
'Concise, comprehensive, and well arranged.'—*Church and School Gazette.*

LONDON: SIMPKIN, MARSHALL, & CO.

LANGLER'S
SPELLING BOOKS.

By JOHN R. LANGLER, B.A., F.R.G.S.

(of the Westminster Training College) one of the Examiners in Geography to the College of Preceptors.

THE

Young Student's Spelling Book.

170 pp. Fcap. 8vo, cloth, price 1s.

May be had in the following parts :—

Part I. (Infants)	1d.
Part II.	1d.

IN CLOTH, 3d.

Standard I.	1d.
Standard II.	1d.
Standard III.	1d.
Standard IV.	1d.
Standard V.	2d.
Standard VI.	3d.

The Schoolmaster says :—'The whole is a valuable collection of words likely to be useful in grounding the Pupils in regard to spelling.'

JOSEPH HUGHES,
PUBLISHER,

PILGRIM STREET, LUDGATE HILL, LONDON, E.C.

No1 Short Stories from English History (now ready) 10d
No2. Early England (nearly ready) . . . 1s.
No3. Middle England (nearly ready) . . ¼
No4 Modern England (in the press) . ⅙.

GILL'S HISTORICAL READERS

GILL'S GEOGRAPHICAL READERS

Now Complete:- Standard II. 8d.; Standard III. 1s.; Stand IV. ¼, Stand V. ⅙, Stand VI. 2s.

2500 square inches of splendid Illustrations and Maps are being prepared.

"The surprise of the Season". Now Ready, 2d. each Standard.

GILL'S IMPERIAL ARITHMETICS.

Sample Copies Half Price.

GEORGE GILL & SONS,
23, WARWICK LANE, LONDON.

INDIA RUBBER STAMPS

'DECIDEDLY THE BEST.'-Our Stamps are beautifully got up, and will last for years. Recommended by the Press. Invaluable for endorsing Cheques, Envelopes, Cards, Marking Linen, Facsimile of Signature, and almost everything. The most complete Dating Stamps made; also Pocket Stamps. Pattern and price lists, two stamps. GEORGE W. SMITH & Co., 44, Springfield Place, LEEDS. AGENTS WANTED; liberal commission. Cannot be surpassed.

BUY THE BEST AND CHEAPEST

Wesleyan Methodist Sunday-School Union,

2, LUDGATE CIRCUS BUILDINGS, LONDON, E.C.

Depot Business Hours—9 a.m. to 7 p.m.; Saturdays, 2 p.m. Reading Room and Reference Library open from 10 a.m to 9 p.m.

The Profits of the Union are devoted to Sunday-School interests, and its Discounts are allowed on the understanding of Cash Sales. When a Remittance is not sent with the Order for Books, etc., it is respectfully requested that it may be forwarded on receipt of Invoice, in order to save the trouble and expense of Ledger Accounts and Statements.

Orders and Remittances should be sent to Mr. WILLIAM BINNS, Assistant Secretary.

Money Orders (General Post Office) and Cheques to be crossed "City Bank."

N.B.—Any Publications named in the Union Advertisements, Lists, or Catalogue, will be sent post-free for the published price in postal order or stamps.

PERIODICAL PUBLICATIONS.

WESLEYAN METHODIST SUNDAY-SCHOOL MAGAZINE, AND JOURNAL OF CHRISTIAN EDUCATION. A Teacher's Handbook and the Organ of the Union. 48 pp., Monthly, 2d.

OUR BOYS AND GIRLS. Illustrated. 8 pp., Monthly, One Halfpenny. Vols, 1s., 1s. 6d.

SENIOR SCHOLAR'S TABLET. Illustrated. | **JUNIOR SCHOLAR'S TABLET.** Illustrated.

For every Sunday.

Packets:—20, 1d.; 100, 5d.; 12 for each Sunday in the Month (Jan. etc.), 3d. | *Books:—Quarter (Jan. to March, etc.), 1d.; Annual 3d.*

Answers to the Home Questions, 1d.; to be supplied only to Teachers and others who may require them for purposes of Examination.

'These neat little books are brimful of good matter for every Sunday throughout the year. The arrangements are highly to be commended.'—*The Practical Teacher.*

LIST OF SCRIPTURE LESSONS for Schools, &c. Annual, 4d. per doz., 2s. 8d. per 100.

SUNDAY-SCHOOL CLASS REGISTER OF ATTENDANCE AND SUBSCRIPTIONS. Annual, 4d.

HYMN AND TUNE-BOOKS, etc.

THE METHODIST SUNDAY-SCHOOL HYMN-BOOK.—589 Hymns. Five Indexes. Desk, Scholars', and Combined Editions. Twenty seven Bindings. From 4d. to 5s. 6d. More than Half a Million Copies sold in two years.

The Methodist Sunday-School Tune-Book,

A Collection of Tunes for the Hymns and Spiritual Songs contained in

'THE METHODIST SUNDAY-SCHOOL HYMN-BOOK.'

The best-known Copyright Tunes to the several Hymns have been secured, including those of H.R H. the late Prince Consort, Mr. Joseph Barnby, Mr. J. B. Calkin, Rev. Dr. J. B. Dykes, Sir G. J. Elvey, Dr. Gauntlett, Rev. W. H. and Miss F. R. Havergal, Mr. E. J. Hopkins, Dr. A. H. Mann, Dr. W. H. Monk, Rev. T. R. Matthews, Sir Herbert Oakley, Rev. Sir F. A. G. Ouseley, Mr. Henry Smart, Dr. Stainer, Dr. C. Steggall, Dr. Arthur Sullivan, and more than sixty others.

The New Tunes—seventy-three in number—are by the following Composers:—

Austin, T. (Two)	Dunman, Rev. S. J. P. (Two)	Jefferson, R. P.	Passmore, J.	Vanner, W.
Barker, J.	Dunstan, R.	Lee, Wm. W.	Probst, B.	Walford, R. J.
Barnby, J. (Five)	Elliott, J. W. (Two)	Mann, Dr. A. H. (Four)	Rhodes, A., R.A.M. (Five)	Walker, E.
Booth, W.	Farmer, John (Two)	Matthews, J.	Rhodes, Jane	Wallhead, T. (Two)
Brown, A. H. (Two)	Foster, Rev. H. J.	McCullagh, Rev. H. H.	Richards, P. R.	Wild, T.
Buxton, E. J.	Gauntlett, Dr. H. J.	Mills, R. Heath (Three)	Smith, H. A., M.A	Wilkinson, S. W.
Calkin, J. B. (Two)	Guest, John	Mitchell, W., F.C.O.	Squibb, J.	Wiseman, Rev. F. L., B.A.
Comley, J. (Three)	Heins, N.	Nattrass, Rev. J. C. (Three)	Swift, J. Fred. (Three)	Woodward, W. Seb.
Dale, C. J.	Hopkins, E. J. (Two)	Newman, R. S. (Three)	Turpin, E. H.	Unknown (One)

METRES.—One Hundred and Seventy-six. | TUNES.—Five Hundred and Thirty-three.

INDEXES.

Alphabetical Index of Tunes. | Metrical Index of Tunes. | First Lines of Hymns and Tune-Numbers. | Numbers of Hymns and Tunes.

Notation and Tonic Sol-fa Editions, uniform, 2s. 6d., 3s., 4s., 5s. 6d., 7s. 6d., 10s. 6d., 12s. 6d., 12s. 6d., 16s.

SPIRITUAL SONGS.—Both Notations on same leaf, 8d. per 100; Books of Words, 3s. 8d. per 100. **THE CHILD JESUS.**—Songs, Music, and Illustrations, 1s., 1s. 6d. **SERVICES OF SONG**—4d. each. **MORNING SERVICE IN D**, by C. J. Dale, 1s. **ANTHEM IN G**—"Suffer Little Children," by C. J. Dale, 2d. **ANTHEM IN F**—"Remember now thy Creator," by Josiah Booth, 4d.

BIBLE CARTOONS, READINGS, etc.

SCRIPTURE READINGS AND LESSON BOOKS.—LIFE OF JESUS, 32 p.p., Cloth, 2d., 16s. per 100; Large Type Edition, Sheets, 3d., Set of 16, 3s.; Boards, 8d.; Set of 16, 10s. Spanish Edition, 32 pp. 4d.; 32s. per 100. Words of Jesus, 32 pp., cloth, 2d.; 16s. per 100. Old Testament Narratives, 32 pp., Cloth 2d.; 16s. per 100.

ILLUSTRATED READINGS—LIFE OF JESUS.—On strong Cloth (36in. by 27) 2s. each; Set of 21, £2; Mounted like a Map, 2s. 8d.; Set of 21, 53s. 4d.; One Mount, and with Illustrated Cover, 42s.

BIBLE CARTOONS—LIFE OF JESUS.—21 Subjects (27in. by 23) 1s. The Last Supper (23in. by 34) 5s. The Series of 22 in a Box, 21s. In Album Form, £2 2s. On Strainer, varnished, 3s. 4d. each. (The Last Supper, 5s.) Set of 22, 63s.

MINIATURE CARTOONS—LIFE OF JESUS.—In Gold and Sepia, 1d. (post free) 8d. per doz.; Set of 21, 1s. 4d.; Mounted and Glazed, 6d. Set of 21 in a Box, 10s. **TEXT CARTOONS**—2d., 1s., 1s. 8d., 2s. 8d.

CARTOONS IN TINTS—Acts of the Apostles.—8d., 3s. 4d.; Set of 6, 3s. 6d., 3s. 4d.; Set of 6, 18s.

CARTOON IN COLOURS—The Four Wise Children.—2s. 6d.; 5s.

WALL TEXTS (Lesson Texts)—2d. each, any 13 Texts, 2s.; set of 53 Texts, 7s. 6d., 16s. TEXTS ON CLOTH.—Banner Texts, 5s. and 21s.; Ribbon Texts, 4s.; Shield Texts, 4s.; Scroll Texts, 1s. 6d. and 5s.

ILLUMINATED CERTIFICATES.—1s. 10d., 3s. 8d. and 5s. 6d. per dozen. **LABELS.**—3s., 5s., and 6s. per 100., etc.

RECENT PUBLICATIONS.

ANECDOTAL ILLUSTRATIONS OF THE GOSPEL OF ST. MARK. (The International Lessons for 1882.) Arranged in the Order of Chapter and Verse. Limp cloth, 1s.

'A unique commentary on this Gospel.'—*Bookseller.*

THE RIVER SINGERS. By WILLIAM ROBSON. Cloth, gilt, 1s. 6d.

'It is a pretty little tale.'—*Church Bells.*

KILKEE. By ELIZA KERR, Author of 'The Golden City,' 'Slieve Bloon,' etc. Cloth, gilt, 2s.

'There is nothing of the sensational school, though plenty of incident, in this highly commendable little tale.'—*Practical Teacher.*

PLEASANT TALKS ABOUT JESUS; Half hours with the Children. By the Rev. JOHN COLWELL. Crown 8vo, cloth, gilt, 2s. 6d.

'We have been delighted with this volume of addresses to children. It is beautiful in thought, simple in language, lively in style, full of sympathy with children, and the important truths it contains are made plain by illustrations, interesting and to the point. Mothers would find in it a most helpful Sunday friend, and Sunday-School teachers obtain many useful hints.'—*The Christian.*

NOTICE FORMS for Committee and Teachers' Meetings, 2s. per 100.

THE METHODIST SUNDAY-SCHOOL REGISTERS AND RECORDS. A complete series. Prices and specimen pages on application.

London: 2, Ludgate Circus Buildings, E.C.; 2, Castle Street, City Road, E.C.

ORDERS FOR
SCHOOL APPARATUS,

INCLUDING

School Desks, Black Boards, | *Easels, Form and Colour, Chalk, Slates, Slate Pencils,* | *Object Lessons, Globes and Wall Maps,* | *Ball Frames, Drawing Models,* | *Kindergarten, School Stationery,*

Executed on the most favourable terms.

THOMAS LAURIE, 31, Paternoster Row, London.

ADOPTION BY HER MAJESTY'S GOVERNMENT OF LAURIE'S COMPREHENSIVE SCHOOL DESK.

(COPY.)

'WAR OFFICE, 23rd December, 1881.

'SIR,—With reference to your letter of the 19th inst., respecting *Laurie's Comprehensive School Desk and Seat*, I am directed by the Secretary of State for War to acquaint you that the Specification and Drawings of the same are passing through the press.

'I am, sir, your obedient servant,

'To Mr. THOMAS LAURIE, (Signed) 'R. DAWSON SCOTT.

'31, Paternoster Row, London. 'For Inspector-General of Fortifications.'

This Desk is admirably suited for needlework and drawing classes.

Testimonial from Rev. Dr. HAIG BROWN, Charterhouse Schools.

'The desks are giving great satisfaction. They are admirably well adapted for their purpose; they are very durable, and the cost of them is remarkably moderate.'

From the BRISTOL SCHOOL BOARD.

'The desks are giving great satisfaction, and are very much admired.'

LAURIE'S KENSINGTON READERS.

'It was the general opinion of the members that these readers were *the very best in the market* to meet the requirements of the Government.'—EDMUND C. WILLMOTT, *Secretary to the Rhymney and Western Valleys Teachers' Association.*

'I firmly believe that they are well suited for all the schools of our country, and will at once call the attention of the Committee to them.'—JOHN LEWIS, *Chairman of the Carmarthen School Board.*

LAURIE'S VICTORIA READERS.

With Coloured Frontispiece of the Queen and Prince and Princess of Wales.

The aim of the 'VICTORIA' and of the 'KENSINGTON' Series is to make reading *a source of real pleasure to children*, by arousing *an eager interest in it.* Progress is thus made both rapid and secure.

LAURIE'S SCHOOL LIBRARIES.

In Strong Wood Bookcases, with Catalogue, and Fitted with Lock and Key.

20 VOLUMES, containing above 4,000 pages of reading, in strong Wood **BOOKCASE**, with Door, Lock, Key, and Catalogue, Net Cash ... ... £2.

Every Additional 10 Volumes, in Bookcase suitably Enlarged ... ... £1.

LAURIE'S INFANT-SCHOOL REQUISITES.

Kindergarten Tables, Boxes of Letters, Lesson Sheets on Boards, | *Form and Colour, Clockface and Tellurion, Pictures of Animals,* | *Pictures of Flowers, ,, ,, Fruits, Manufactures, Food,* | *Pictures of Trades, Forest Trees, Scripture Pictures.*

LAURIE'S KENSINGTON SERIES

OF

BOOKS FOR PUPIL TEACHERS.

Grammar, Composition, | History, Music, | Language, Elocution, | Geography, Arithmetic, | Spelling and Dictation.

A LIBERAL DISCOUNT TO THE PROFESSION.

THOMAS LAURIE, 31, Paternoster Row, London.

APPROVED ELEMENTARY SCHOOL-BOOKS.

IN GLEIG'S SCHOOL SERIES.

HISTORY of ENGLAND. By the Rev. G. R. GLEIG, M.A. Being the First Book of History. 18mo, 2s., or in Two Parts, 9d. each.

By the same Author, in the same Series:—
SECOND BOOK OF HISTORY, BRITISH COLONIES, 1s.
THIRD BOOK OF HISTORY, BRITISH INDIA, 9d.
FOURTH BOOK OF HISTORY, SACRED HISTORY, 2s.

HISTORICAL QUESTIONS on the above Four Histories. 18mo, 9d.

SIMPLE TRUTHS, in EASY LESSONS; being an Abridged Scripture History. 18mo, 6d.

GLEIG'S BOOK of BIOGRAPHY: Lives of Crompton, Herschel, Miller, Stephenson, and Beaver. 18mo, 9d.

The CHILD'S FIRST BOOK of GEOGRAPHY, in a Series of Easy Reading-Lessons. By W. HUGHES, F.R.G.S. 18mo, 9d.

GENERAL GEOGRAPHY. For the use of Beginners. By W. HUGHES, F.R.G.S. 18mo. 9d.

GEOGRAPHY of the BRITISH EMPIRE. For the use of Beginners. By W. HUGHES, F.R.G.S. 18mo, 9d.

EXAMINATION QUESTIONS on GENENAL GEOGRAPHY. By W. HUGHES, F.R.G.S. 18mo, 9d.

PHYSICAL GEOGRAPHY for BEGINNERS. By W. HUGHES, F.R.G.S. 18mo, 9d.

HISTORY of ROME. By the Ven. R. W. BROWN, Archdeacon of Bath. 18mo, 9d.

HISTORY of GREECE. By the Ven. R. W. BROWN, Archdeacon of Bath. 18mo, 9d.

The FIRST THREE BOOKS of EUCLID'S ELEMENTS of GEOMETRY. By T. TATE, F.R.A.S. 18mo, 9d.

PRACTICAL GEOMETRY, containing the Construction of all the most useful Geometrical Problems. By T. TATE, F.R.A.S. 18mo, 1s.

MECHANICS and the STEAM-ENGINE Simplified for Beginners. By T. TATE, F.R.A.S. 18mo, 9d.

HYDROSTATICS, HYDRAULICS, and PNEUMATICS Simplified for Beginners. By T. TATE, F.R.A.S. 18mo, 9d.

MAGNETISM, VOLTAIC ELECTRICITY, and ELECTRO-DYNAMICS Simplified for Beginners. By T. TATE, F.R.A.S. 18mo, 9d.

ELEMENTS of MENSURATION and LAND-SURVEYING. By the Rev. J. HUNTER, M.A. 18mo, 1s. KEY, 1s.

PLANE TRIGONOMETRY, with Problems and Tables. By the Rev. J. HUNTER, M.A. 18mo, 1s. KEY, 9d.

TREATISE on LOGARITHMS, with Tables, etc., adapted to the above. By the Rev. J. HUNTER, M.A. 18 o, 1s. KEY, 9d.

EXPLANATORY ENGLISH GRAMMAR for Beginners. By WALTER M'LEOD, F.R.G.S. 18mo, 9d.
*** Or, for Elementary Schools, in Four separate Parts:—I. and III. 1d. each; II. 4d.; IV. 6d. *Definitions*, for Home Study, 1d.

MANUAL of ARITHMETIC, containing 1,900 Questions for Class Instruction: By WALTER M'LEOD, F.R.G.S. 18mo, 9d.

MY FIRST SCHOOL BOOK to Teach me Reading and Writing. By WALTER M'LEOD, F.R.G.S. 18mo, 6d.

MY SECOND SCHOOL BOOK to Teach me Reading and Spelling. By WALTER M'LEOD, F.R.G.S. 18mo, 9d.

STEVENS & HOLE'S GRADE LESSON BOOKS,

In SIX PARTS or STANDARDS; each embracing Reading, Spelling, Writing, Arithmetic, and Exercises for Dictation.

By the Rev. E. T. STEVENS, M.A., Oxon., and the Rev. C. HOLE, LL.D., Rector of Holy Trinity, Cape Town.

THE FIRST STANDARD. Price 9d.
THE SECOND STANDARD. Price 9d.
THE THIRD STANDARD. Price 9d.
THE FOURTH STANDARD. Price 1s. 3d.
THE FIFTH STANDARD. Price 1s. 3d.
THE SIXTH STANDARD. Price 1s. 6d.

ANSWERS to the ARITHMETICAL EXERCISES in STANDARDS I. II. and III., price 4d.; in Standard IV., price 4d.; in STANDARDS V. and VI., price 4d.; or, complete, price 1s. 2d. cloth.

THE GRADE LESSON BOOK PRIMER. Price 3d.
FIRST LESSONS IN READING, 24 Folio Sheets. Price 4s. 6d.
INTRODUCTORY LESSON BOOK TO STANDARD I. Price 6d.
THE ADVANCED LESSON BOOK, a Sequel to the Grade Lesson Books. Price 2s.

KNOWLEDGE FOR THE YOUNG.

A New Edition, in 18mo, price ONE SHILLING.

THE STEPPING-STONE TO KNOWLEDGE;

Comprising several hundred Questions and Answers on Miscellaneous Subjects, adapted to the capacity of the Youthful Mind. By a MOTHER.

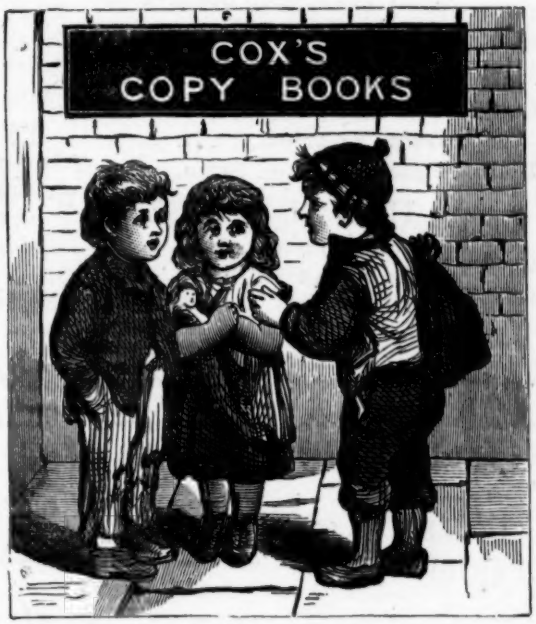
In the same SERIES, price One Shilling each, STEPPING-STONES to

KNOWLEDGE, SECOND SERIES, 1s.
ENGLISH HISTORY, 1s.
IRISH HISTORY, 1s.
BIOGRAPHY, 1s.
GRECIAN HISTORY, 1s.
ROMAN HISTORY, 1s.
GEOGRAPHY, 1s.
BIBLE KNOWLEDGE, 1s.
ARCHITECTURE, 1s.
ASTRONOMY, 1s.
MUSIC, 1s.
ENGLISH GRAMMAR, 1s.
FRENCH CONVERSATION, 1s.
NATURAL HISTORY, Two PARTS, 1s. each.

London: LONGMANS, GREEN AND CO., Paternoster Row.

BOLD ROUND WRITING.

COX'S **Copy Books** ARE THE *Children's Favourite.*



COX'S **Copy Books** SAVE THE *Teacher's Time.*

NOW READY, IN 15 PARTS, PRICE 2d. EACH.

☞ **A gross (assorted) of these popular Copy Books will be sent CARRIAGE PAID to any address in England, Scotland, or Wales, upon receipt of P.O.O. for 18s.**

THE IRISH TEACHERS' JOURNAL says:—

"Having now given the entire plan and scope of these Copy Books, we have only to advert to the style of writing which they contain. On this point we can confidently state that Mr. Hughes's Copy Books are second to none in the market, and, in many respects, they are superior to any we have seen. From beginning to finish a careful gradation is maintained, showing they are the work of a practical teacher; and it will be the pupil's own fault who practises these Copy Books if he do not acquire and write an excellent hand for life."

JOSEPH HUGHES, Educational Publisher,
PILGRIM STREET, LUDGATE HILL, LONDON, E.C.
May be ordered through any Bookseller.

MR. MURRAY'S LIST.

EDUCATIONAL SERIES.

LATIN COURSE.

Principia Latina, Pt. I. 3s. 6d.
Appendix to Part I. 2s. 6d.
Principia Latina, Pt. II. 3s. 6d.
Principia Latina, Pt. III. 3s. 6d.
Principia Latina, Pt. IV. 3s. 6d.
Principia Latina, Pt. V. 3s.
Young Beginner's 1st Latin Book. 2s.
Young Beginner's 2nd Latin Book. 2s.
Student's Latin Gram. 6s.
Smaller Latin Gram. 3s. 6d.
Tacitus. Selections. 3s. 6d.

FRENCH COURSE.

French Principia, Pt. I. 3s. 6d.
Appendix to Part I. 2s. 6d.
French Principia, Pt. II 4s. 6d.
Student's French Gram. 7s. 6d.
Smaller French Gram. 3s. 6d.

GERMAN COURSE.

German Principia, Pt. I. 3s. 6d.
Germ. Principia, Pt. II. 3s. 6d.
Practical Germ. Gram. 3s. 6d.

ITALIAN COURSE.

Italian Principia, Pt. I. 3s. 6d.
Italian Principia, Pt. II. 3s. 6d.
[*Nearly ready.*

GREEK COURSE.

Initia Græca, Part I. 3s. 6d.
Appendix to Part I. 2s. 6d.
Initia Græca, Part II. 3s. 6d.
Initia Græca, Part III. 3s. 6d.
Student's Greek Gram. 6s.
Smaller Greek Gram. 3s. 6d.
Greek Accidence. 2s. 6d.
Plato. Selections. 3s. 6d.

ENGLISH COURSE.

English Grammar. 3s. 6d.
Primary English Gram. 1s.
Primary Hist. of Britain 2s. 6d.
Modern Geography 5s.
Smaller Modern Geog. 2s. 6d.
English Composition. 3s. 6d.

DR. SMITH'S SCHOOL DICTIONARIES.

CONCISE DICTIONARY OF THE BIBLE. 21s.
SMALLER DICTIONARY OF THE BIBLE. 7s. 6d.
CLASSICAL DICTIONARY. 18s.
SMALLER CLASSICAL DICTIONARY. 7s. 6d.
SMALLER DICTIONARY OF ANTIQUITIES. 7s. 6d
LATIN-ENGLISH DICTIONARY. 21s.
SMALLER LATIN-ENGLISH DICTIONARY. 7s 6d.
ENGLISH-LATIN DICTIONARY. 21s.
SMALLER ENGLISH-LATIN DICTIONARY. 7s. 6d.

MURRAY'S STUDENT'S MANUALS.

SEVEN AND SIXPENCE EACH VOLUME.

Old Testament History.
New Testament History.
Ancient History.
Ecclesiastical History. 2 vols.
English Church History. 2 vols.
Roman History.
Greek History.
Gibbon's Rome.
Hume's England.
Hallam's Middle Ages.
Hallam's England.
History of France.
Ancient Geography.
Modern Geography.
English Language.
English Literature.
Specimens of English Literature.
Modern Europe. [*In preparation.*
Blackstone.
Moral Philosophy.

DR. WM. SMITH'S SMALLER MANUALS.

THREE AND SIXPENCE EACH.

Scripture History.
Ancient History.
Ancient Geography.
Rome.
Greece.
Classical Mythology.
England.
English Literature.
Specimens of Eng. Literature.

*** *DETAILED CATALOGUE SENT GRATIS BY POST ON APPLICATION.*

JOHN MURRAY, ALBEMARLE STREET.